# Editorial

IT is interesting to see the opinion expressed in the last-received issue of the English Wireless World concerning short-wave broadcasting. In its editorial, reference is made to remarks published in the American amateur magazine QST on the same subject.

The general attitude taken in both cases is that the use of short-wave channels for international short-wave broadcasting is grossly overdone. It is suggested that many more useful things could be accomplished with such channels than happens at present.

With this point of view, I heartily concur.

At the last International convention in Atlantic City, the most prominent feature was the terrific onslaught made by national broadcasting interests on available frequencies to be used for high powered propaganda stations directed to almost every nook and cranny of the universe. No other demands for frequencies in their view, had any prior claim over such services. As a result, everybody suffered in order that the air shall be filled with still more transmitters telling their story to the world.

It is, of course, indicative of the general political state of the times—the realisation of those with international axes to grind that if things are said often and loudly enough people will believe them.

I would not say that radio cannot play a big part in airing any national point of view, and supplying the rest of the world with news about what goes on. What I do say is that such purposes can be served very much more economically than is now the case, and certainly with fewer frequencies than will shortly be used.

I would go so far as to say that, sooner or later, this barrage of short-wave stations will defeat its own object. Listeners will become tired of being "earbashed" ad nauseam with easily recognised, one-sided, inspired propaganda. They will cease to pay serious attention to what is said, and listen merely to the very meagre entertainment which such stations provide.

In the meantime, others suffer in order that this may occur. The amateur transmitters, for instance, have been most unjustly pushed around, even to the extent of losing most of their traditional and valuable "40 metre" band to give more channels. Their famous international band at 20 metres has been lopped for still more broadcasting.

There is, unfortunately, little that can be done about this state of things. It is a poor commentary on the desire of the nations generally to work in harmony with each other. It is not a good augury for peace when we see so many anxious to pour their opinions, criticisms and creeds at such length into the ears of everybody else.

Well might the pioneers of radio turn in their graves, those of them who are there, and ask the world what use it is making of their brainchild. The peace of the world will be hastened when we see radio being used to broadcast ideals of tolerance and understanding. One cannot but fear that in the next few years, there will be little of that ringing in the ether bands of the world.

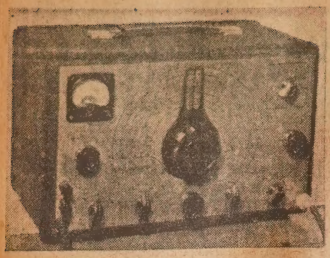
John Moyle

## INDEX






EDITOR: JOHN MOYLE, M.I.R.E. (Aust.) (VK2JU). TECHNICAL EDITOR: NEVILLE WILLIAMS, A.M.I.R.E. (Aust.) (VK2XV).



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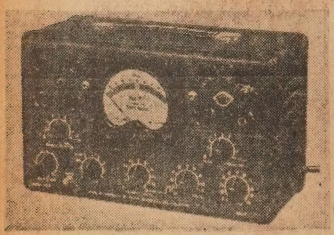

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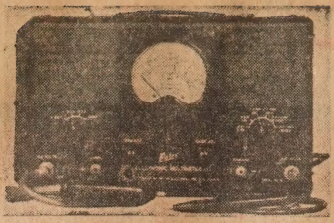

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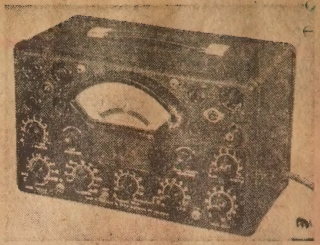

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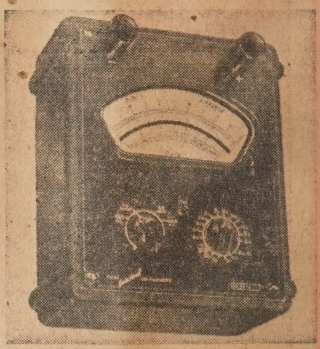
*Price:* £29/17/6. Wooden, leatherette-covered carrying case, £2/5/-.



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# BIG BRITISH BOAT TO FLY SOON

The construction of the Saunders-Roe 100-Passenger Flying-boat, the SR/45 at Saunders-Roe Ltd., Cowes, Isle-of-Wight. In the course of construction at Cowes are three 140-ton flying-boats, of a size and dimensions which, not so many years ago, would have been considered almost fantastic. These flying-boats, at present unnamed, but known for the time being as the SR/45, have a wing span of 220 feet, a length of 148 feet and weigh approximately 140 tons. They have a range of 5500 miles in still air and a cruising speed of over 350mph. (See story page 7).

An English windmill needs no coal, oil, or atoms to grind its grain. This one is still operating in Sturton-by-Stour, Lincs.

# POWER! for the future

● BY THE EDITOR

**Power and sources of power are the most important things today in carrying on the world's work. It is true to say that all man is capable of doing is to move things. When he needs power greater than his own strength, he must find the means to produce it. But one by one, his sources of power are drying up. Coal mines and oil wells will not last for ever. How will he move his machines of the future?**

DURING the past hundred years or so the industrial revolution has taught us to rely on machines, large and small. Nearly all our activities depend upon them. It was steam power which first turned the wheels, made possible the factories, moved trains and ships and started on its way the mighty march of scientific and industrial progress.

Time went on, and opened up new sources of power. Internal combustion engines were invented, using petroleum and other natural fuels. Electricity was found to be an exceptionally flexible and valuable source of power in countless ways.

Today, the whole of our economy would collapse if these sources of power were no longer available.

We have seen two great wars, neither of which could have been waged at all without access to essential fuel. In the last war, petrol was often more valuable than ammunition. Tanks could retire when they could no longer fight, transport and communication by air were required before battles could begin. Indeed, plans for war could not even be formulated unless sources of fuel supply were assured. To guarantee these sources, whole campaigns were organised and carried out.

The latest types of jet and rocket projectiles depend on fuel from natural sources—it is manufactured from materials found somewhere on the earth or in it.

## ATOM POWER

Now we have the prospect of atom power to replace or supplement those already mentioned. As a result, international competition is fierce for ownership of regions where radioactive deposits are to be found, just as it was for the rich deposits of oil in the Indies and the East.

The big point about all these power sources is that they are expendable. Eventually they will be exhausted. No one dreamed that supplies would be drained at the present rate. Already coal is becoming harder to get, and the oil supplies known at present will be exhausted in a measurable period of years. It has been stated that there is not enough petrol in sight in the world to support another war on the scale of the last. It ate up stocks which were the due of generations to come.

Looking far ahead, what is to become of our machines when there is nothing left to drive them? Are there any substitutes which cannot be drained dry? If there are, how can we tap them?

The importance of these answers is so great that, should one nation obtain them before others can do the same, its industrial consequent advantage would be overwhelming. It would virtually guarantee success in any future war. That is why scientists are spending millions all over the world seeking new potentials of power, and new ways to use those which might be discovered.

The possibilities of atomic power are attractive because of the huge amounts which may be obtained

from small particles of matter. So far, only those elements easiest to process have been used. But there is no fundamental reason why several other elements should not take their place. The limiting factor is the cost of developing and manufacturing suitable energy-extracting equipment, balanced against the usefulness of the energy itself. If these difficulties are solved, we might well possess power sources which will last for as long as we can visualise.

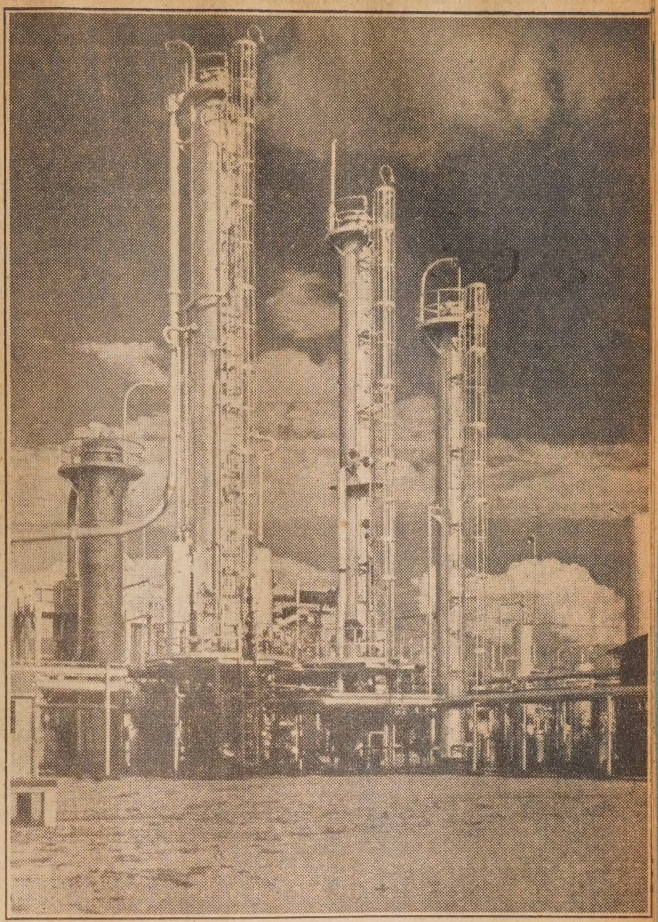
Today we are far from this stage. In fact we can at present use atom power only for the most elementary heat-producing machinery, and the cost of producing this heat from atomic piles is very great. We all know how big explosions are possible with atom bombs, but these can scarcely be considered useful as power sources for industry. Only controlled power is productive, and atom power is hard to control and devestatingly destructive.

## IDEAL POWER

What the world is looking for is a power source which can be easily tapped, which does not involve the use of expendable matter, and the extraction of which does not consume any appreciable amount of energy which itself must be obtained from some source.

Even before steam engines were invented, our forefathers used waterwheels and windmills to drive their simple machines. They were slow, because they were simple, and they were cheap, because the power was free. Can we today find a solution in following their example, and look to natural phenomena for our power?

The initial source of all energy is, of course, the sun. It provided the furnace which fired the crucibles in which the universe itself was fused. All the power sources we now have —coal, petrol, uranium—have been formed through processes originated and carried on through the sun's heat.



Fractionating towers of a big oil refinery. Recent years have cut deeply into oil supplies. What will happen when no more is available?

It is a far cry from the simple windmill to this atom power factory in USA, in which took place the development of the atomic bomb. Atom power must still be tamed before it is useful.

This heat energy is still being poured on the earth all the year round in enormous quantities. Expressed in terms of horsepower, it represents a fantastic figure. It is sufficient to keep going all the various physical and chemical changes in mineral, plant and animal life the world over, and, as far as we know, it will continue to shine as long as the earth exists as such. For if ever it ceased, we would cease with it, and our power problems would be at an end.

## SUN MACHINES

Attempts have been made to concentrate the sun's heat to fire boilers and operate machinery. About 12 months ago, Calvin Walters wrote an article about experiments conducted in the Nile Valley quite a few years ago—experiments which proved it to be a practicable idea.

There are a number of problems which immediately suggest themselves, of course. It is all very well to have sun machines, but what

**Continued on Page 87.**

# BIG BRITISH PLANES TAKE SHAPE

**By E. COLSTON SHEPHERD**

SOON, therefore, we shall begin to see whether the British experiment in big commercial aircraft was well conceived. We shall also be able to see whether the flying-boat, largely neglected, except by Britain and France, can expect to play a useful part in commercial air transport.

Up to the beginning of this year advocates of the flying-boat appeared to have an unanswerable argument for those who favored the big landplane. The flying-boat, they said, would need no costly runway, whereas the big landplane would have to be so careful about the strength of its runways that it would find only three airports in the world where it dare land. Now flying-boat enthusiasts are not so sure of their advantage.

## NEW UNDERCARRIAGE

Towards the end of January the Parliamentary Secretary of the Ministry of Civil Aviation said, in the House of Commons, that they were hoping a redesigned undercarriage on the 130-ton Bristol Brabazon would enable that landplane liner to use runways at present used by the current types of liner. Until certain engineering experiments had been completed he was unwilling to go into details.

We may have to wait for details, but a reasonable deduction can be made. In the original design the main undercarriage of the Brabazon consisted of two massive legs, with a pair of wheels at the nose, which were intended to take the whole 130-ton weight of the loaded aircraft. Any modification designed to avoid demanding runways of abnormal bearing strength would have to aim at spreading that load over a somewhat bigger surface . . . in other words, at increasing the number of wheels.

## BRABAZON FUTURE

Experiments directed towards that end are no doubt proceeding. If they succeed, a good many anxieties about the Brabazon will have been relieved and, as the Parliamentary Secretary said, a good many more airports will be open to that big liner. There are runways at the London airport capable of use by the Brabazon as it was originally designed, but their cost was beyond the means of most countries, and the Brabazon in that form would have been restricted to operation between Britain and the United States. As a 70-seater, that would be its most appropriate route, but we would prefer that it should have alternative airports at its disposal in case of bad weather or any other emergency.

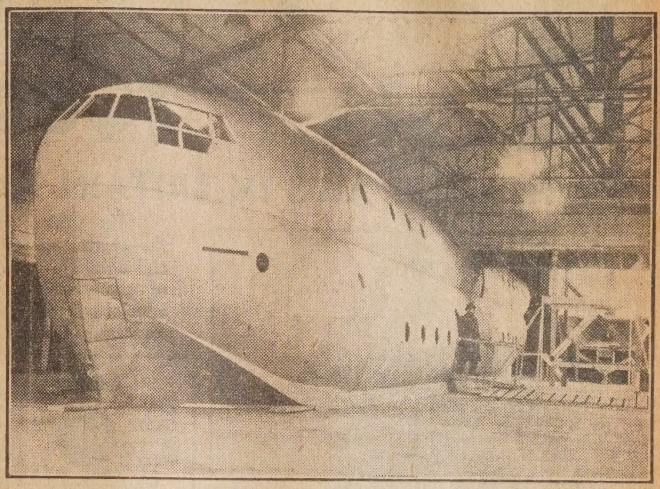
If, indeed, the Brabazon is about to divest itself of that limitation, we may rightly ask how prospects of a still bigger flying-boat will be affected. Without having a really big landplane liner in sight the United States seems to have decided there is no place for a flying-boat in her system of commercial air transport. There is quite a wide disparity between the sizes of airliners which the United States and Britain propose to use. In rough figures the loaded weight of the Stratocruiser is 160,000lb. and that of the Brabazon is 260,000lb.

If traffic offering is heavy enough, Britain's big unit should be more economical. British faith in the big unit has extended to the flying-boat. Three are being built by Saunders Roe to match three Brabazons which are being built by Bristol. They will have to cope with one handicap. Their terminal cannot be as close to the heart of London as the landplane terminal. It may be five times as far away. Are there other advantages which the flying-boat can set against that?

Part of the answer to that question may be provided by this year's operational trials of the Short Shetland. This boat, a solitary prototype, is nearly twice the weight of our present flying-boats. It is likely to be handed over to British Overseas Airways for a period of intensive flying. The corporation will try the big boat in a variety of harbors on its regular routes and will discover what special handling, mooring and maintenance provisions must be made for bigger, heavier, and more powerful types of boat. It may also gather some useful information about the seaworthiness of a bigger hull.

Passengers have already shown

(Continued on Page 17)



Side by side in a vast hangar close to the waterfront at Cowes, IOW, the three greatest flying-boats ever to be built in Britain are slowly taking shape. When they are finished and ready to take off fully loaded they will weigh 130 tons apiece. Each will carry up to 100 passengers. The three aircraft are the first six-engined Saunders Roe SR 45's on order for British Overseas Airways, likely to provide a 300 mph luxury, non-stop service between Britain and America early in the 1950's. One of the many features of the flying-boats is a cocktail bar in the after-end, big enough for fifteen or sixteen people, without crowding.

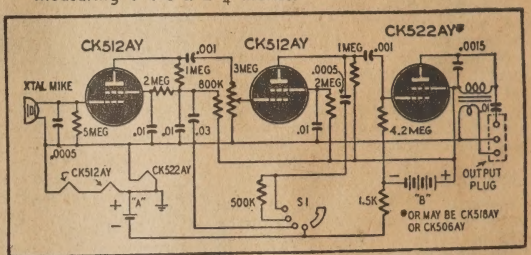
**In the next few months Britain will probably have on operational trials a flying-boat nearly twice the loaded weight of those now in regular service with British Overseas Airways. This may be taken as an introduction to still bigger boats which should begin their test flights in 1950. Before this year ends, the first of the big new landplane air liners should also be flying.**

See Picture on Page 3

# Technical Review

## HEARING AIDS IN BRITAIN AND THE U.S.

The subject of much discussion in recent years, the printed circuit technique is making its commercial debut in hearing aids. A complicated collection of components—173 individual items—in one commercial unit has given way to a printed steatite wafer measuring 1 1-8 x 2 ¼ inches.



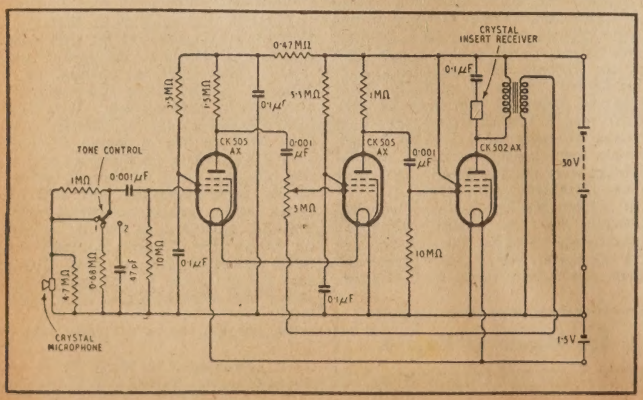

THREE miniature valves are added separately to the wafer and the whole unit, complete with auxiliary components is mounted in a case measuring 4-1/8 x 2-3/8 x 7/8 inches. The actual electrical circuit looks much the same as any other for this type of equipment.

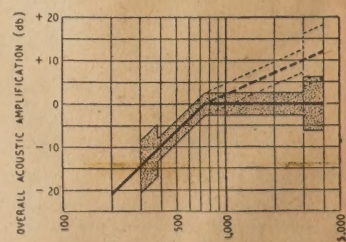
Many of the components are manufactured as the sprayed wiring process is followed. Silver ink is first brushed over a stencil covering the plate, the silver being consolidated and bonded to the steatite by heat treatment. A graphite paint is then applied through a second stencil to form the resistors, and these too, are heat treated. Third step is to add small discs which act as condensers.

Finally, the miniature valves are added, the microphone, batteries, tone and volume controls and an ingenious plug which allows the use of alternative receivers, crystal, magnetic air, and bone conduction.

In Britain, an advisory committee to the Medical Research Council has published a report on standards for hearing aids to be distributed under the National Health Service. The frequency curve shows attenuation below 750 c/s and a response above that either level of rising by 5db. per octave, according to tone control setting. Shaded areas represent the permissible deviation from the proposed optimum standard.

Amplification at 750 c/s must be not less than 40db. and the acoustic response curve linear up to pressures of 200 dynes per square cm. Specifications also cover power output, effect of battery life and voltage and behavior under adverse temperature conditions. A suggested circuit is shown. (Wireless World, Jan. 1948.)




A test of 228 selected patients indicated that most requirements would be met by a hearing aid conforming to the frequency standard shown above. On the left is one of two suggested circuits, using miniature valves and a crystal microphone and receiver.

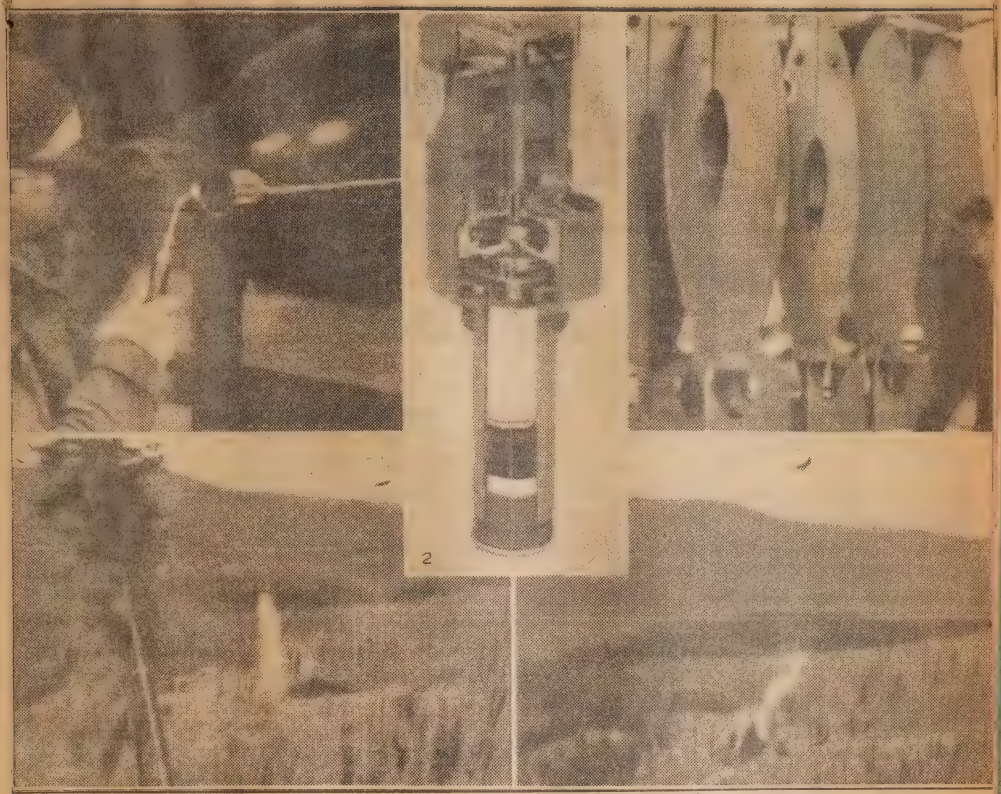
## RADIO AND HOBBIES, APRIL ISSUE

# MISPLACED PAGES

You may find some pages in this issue of Radio and Hobbies in incorrect sequence.

Through an error in printing, it is possible that pages 28 and 64, 33 and 69, 40 and 52, and 45 and 57 have been transposed.

We regret any inconvenience that this will cause you. Shortage of newsprint precluded our printing extra sections of the magazine to replace those wrongly assembled.—THE EDITOR.



(1) Installing fuse well. (2) The radio proximity fuse. (3) "B ombs" with fins attached. (4) Experimental fire. (5) Bomb takes effect as plane circles overhead.

# RADIO PROXIMITY FUSE FIGHTS FIRE

**Recent tests conducted by the US National Bureau of Standards have demonstrated the possibilities of fighting forest fires with extinguishers fitted with a proximity fuse.**

CHARACTERISTICS of the radio proximity fuse make it particularly adaptable for fire fighting. Because it bursts the fire-extinguisher bomb at the desired height above the ground, it sprays the extinguishing material, which may be water or a fire-smothering chemical, over the burning area.

The radio proximity fuze is an extremely small and tough radio sending and receiving station. Immediately upon being released, it begins to transmit radio signals. These signals are reflected back to the fuze from the ground, and when they reach a certain intensity, the receiver triggers an electronic switch that detonates the bomb.

The bombs for these tests were constructed from 165-gallon auxiliary fighter fuel tanks stabilised with the 2000-pound general-purpose bomb fin. A fuze well was installed in the nose, and a burster well extended through the tank. The burster well included a charge to rupture the tank and disperse the extinguishing material after the proximity fuze had functioned.

A B-29 bomber was used for tests of level bombing and P—47 Thunderbolts for dive and glide bombing. Forty-two bombs with proximity fuzes were dropped. Although the containers were not designed for bombing and ballistic data were not available, the accuracy of the bombing, particularly from the B-29, was very good. Improved accuracy, however, should be possible with bombs of known ballistic properties.

Plans for future tests include the use of foam instead of water, which should give a better extinguishing blanket and a better indication of the pattern. Other sizes of bombs will also be used, including a 4000-pound light-case bomb that holds 260 gallons; both of these will have proximity fuzes. In addition tests are to be made with the 100-pound chemical bomb case, with a capacity of 8 gallons of fire extinguishing liquid; these will not be equipped with proximity fuzes.

The P-47 Thunderbolt, used for dive and glide bombing of forest fires, carries two airborne fire extinguishers. Fires were purposely started for tests of this equipment.

# VALVES AND THEIR APPLICATIONS

By M. G. SCROGGIE, B.Sc., M.I.E.E. (Eng.)

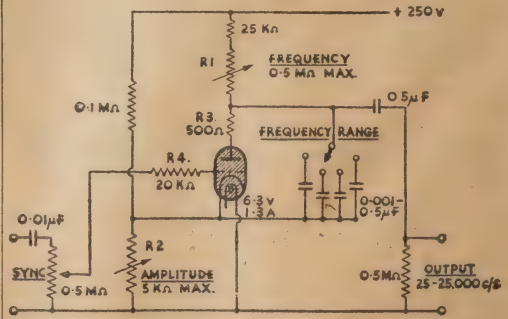
## No. 1: Mullard GAS TRIODE EN31

OF the many applications of "soft" triodes, time base generation has always been the most widely used. The main reason for its popularity in that role is its ability to change suddenly from zero to a heavy current at a low voltage, and thereby to discharge a capacitor so quickly that the flyback is accomplished in a very small fraction of the whole cycle. By contrast, a hard valve requires some amplified triggering device to speed up the discharge, and even then is not such a low-resistance "switch."

The explanation, of course, is that directly any appreciable electron current starts to flow through low-pressure gas the molecules are ionized, or split up into electrons and positive ions, forming an electrically - neutral highly - conducting cloud. It is as if the anode were suddenly brought within a microscopic distance of the cathode. There is, therefore, negligible space charge for the anode voltage to overcome, even when the current is very heavy. The anode-to-cathode voltage is constant at quite a moderate critical value, depending on the kind of gas enclosed. Although the 33 V drop in the EN31 is higher than in a mercury-vapour valve, its characteristics depend much less on temperature.

Since the control grid is smothered by the conducting cloud, it ceases to control until the discharge ends through lack of voltage to maintain it. Its function is then to determine, by the negative bias applied, the anode voltage needed to restart the discharge, and hence the amplitude of the time-base voltage. In the EN31, 1 volt of bias is needed for every 35 additional anode volts.

The circuit diagram shows a very simple form of time base generator. It can, of course, be modified to include one of the usual linearizing devices, but except for precise work the stroke is linear enough if restricted to about 30 or 40 V. R1 controls the speed of charge, and R2 the bias. R3 is to limit the discharge to the rated maximum, 750 mA. 2 ohms for every HT volt is well on the safe side. R4 is another limiting resistance, to keep the grid current within 1 mA. The total resistance between grid and cathode should be 0.75 megohms at most; preferably less. Since the bias required for control is only 1-35th of the anode voltage, the heater can be joined to — HT without fear of its voltage to cathode exceeding the rated limits of 0 to —100 V.




Mullard

*This is the first of a series written by M. G. Scroggie, B.Sc., M.I.E.E., the well-known English Consulting Radio Engineer. Reprints for schools and technical colleges may be obtained free of charge from the address below. Technical Data Sheets on the EN31 and other valves are also available.*

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# TUNGSRAM VALVE FITS ALL SOCKETS

**In November last, mention was made in these columns of the ECME system of receiver production, using automatic machinery. Now comes news of a Sargrove-Tungsram valve, type UA55, which is capable of serving in any socket of a receiver. It has been developed especially for ECME-produced receivers.**

THE valve is comparatively small and of robust construction. Effective limitation of size has been achieved by accepting a reasonably small output (of the order of 1 watt) when the valve is used as a power amplifier.

The valve is a combination of two beam tetrodes disposed symmetrically on either side of a common cathode. The heater is rated at 55 V, 100mA, and is, therefore, convenient for series connection in 110 and 220-volt mains supply circuits.

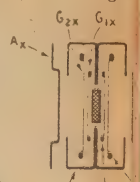
A central screening plate with extensions between the leads to each section of the valve is connected to the cathode and is shaped to act also as the beam-forming plates. In cross-section it is "E" shaped and shields the first and second grid supports from the anode. The accelerator grid wires are aligned behind the grid wires, and a method has been found of doing this without optical aids. It is claimed that a ratio of anode to screen current of the order of 10:1 is maintained throughout the life of the valve.

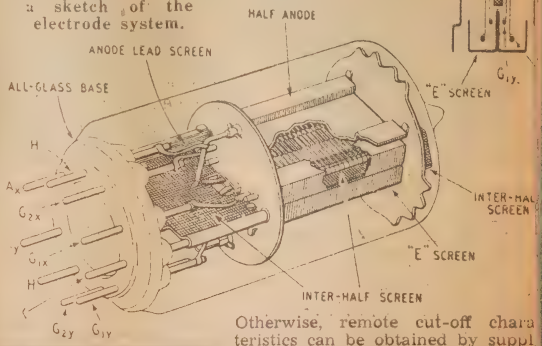
With a screen potential of plus 15V, a high-impedance voltage amplifier with a slope of 4.5 mA is obtained.

The anode-grid inter-electrode capacity is of the order of 0.07 pF per section, and it is, therefore, necessary to use somewhat unconventional circuits for R.F. and I.F. amplification. A neutralised circuit using a capacity centre tap on the secondary of the input transformer may be employed with one half of the valve, the other half being used as second detector. Alternatively, the two halves may be arranged as an amplifier of the Colebrook R-C coupled type, when stable gains of the order of 3 can be obtained at 465 kc/s.


The new UA55 valve and, below, a sketch of the electrode system.

In circuits where the input can be applied to both control grids simultaneously, variable-mu characteristics can be obtained by applying dissimilar voltages to the screens.




Otherwise, remote cut-off characteristics can be obtained by supplying the accelerator grid potential through a comparatively high series resistance.

With anode and screen strapped a high-slope low-impedance triode is obtained. One half of the valve can be used as an oscillator and, these conditions, the other half being employed as a tetrode mixer. With this arrangement and a line voltage of only 90, a conversion conductance of 0.7 mA/V is claimed with a cathode current of 9 mA.

When the two sections are connected in parallel and both screen and anode are supplied from a 90 volt H.T. line, the valve functions as a power amplifier with a slope of 7 mA/V at -5 volts bias and gives over one watt into a load of 2500 ohms with an anode dissipation of 3½ watts.

It may seem rather wasteful to use a valve of this type as a power rectifier, but the makers consider that this is economically justified if specimens which do not meet the required standards for general circuit use, and which would normally be rejected, are earmarked for use as rectifiers. Resistors must be used in series with the first and second grids to limit current, and the D.C. output voltage is substantially the same as the R.M.S. input voltage for currents up to 20-25 mA.

A special nine-pin valve-holder is necessary. (*Wireless World*, December, 1947).

# TAXI CALL SYSTEM POPULAR

**Recent reports from the US indicate that the widest use of civilian transport radio channels is being made by taxicab operators.**

WHEN the F.C.C. assigned frequencies in the 152-162 mc. band for land transportation services in 1945, it was expected that taxicabs would be one of the smallest of the mobile radio services. This was based on the overall number of taxicabs to trucks, buses and railroad vehicles.

The F.C.C. gave railroads 60 channels and land transport 24 channels, of which only one was allotted to taxicabs. Now there are more taxicab radio installations operating on a single channel than exist for all the other vehicles, rail and road, occupying the other 83 channels.

There are approximately 90,000 taxicabs in service, of which no less than 75,000 are destined to be equipped with two-way radio.

Operators say that one radio equipped cab is as useful as two or three cabs without it. Dead mileage is greatly reduced and the earning power increased by some 25 per cent.

Transmitters in the cabs have a power of between 10 and 30 watts. A typical receiver is illustrated above —14 valves and double conversion circuit (*Communications*, December, 1947).

The chameleon is the champion color-changer in Nature. It is able to merge into most complicated patterns and colors for its own protection.

# Animal Magic

**Last month, Calvin Walters showed how animal engineers forestalled man in many ingenious ways. This month he discusses the marvellous manner in which camouflage is employed for their protection, including the ability in some cases to change color in accordance with the prevailing background.**

THE coloring of animals is one of the wonders of Nature, not nly because of its great and aried beauty but because of the mazing scientific principles vhich are involved.

There are so many wonderful ings in nature that we tend to ccept them without a second ought. Yet if we will only stop for moment and observe, we will find never-ending delight in trying to ork out the meaning of all the trange things of Nature around us.

## 'ARIED COLORS

The markings and colorings of nimals are very diverse. They are s varied as their surroundings, and erein lies the secret of this whole natter. One could not imagine anyning so changeable as the immediate urroundings of wild life as regards ie vegetation, type of ground, mount of light and type of rocks, and, &c., which forms the natural nvironment of birds and animals. Jature has provided that its wild life e protected by coloration which imulates as closely as possible the urrounding habitation.

There is a point about this colora-ion which everyone has observed. Almost without exception animals and birds are lighter in coloring on the underside than on the back. Also when the creature is provided with any extra coloration in the form of stripes, spots, and so forth, this coloration extends down the sides and ceases at a point just before the sides curve under.

To the unobservant this feature is not remarkable except as just another peculiarity of nature, but to the scientist it is intensely interesting, inasmuch as it has a truly scientific reason.

## SOLID APPEARANCE

For an animal (and from here I include birds, reptiles, &c., in the category for the sake of brevity) to have full protection it must become relatively invisible against its surroundings. This requires that it must lose its appearance of a solid object.

Now, it is obvious that most of the light falling on an animal comes from the sun or moon, and therefore from above. The back of the animal is therefore in stronger light, while the under part is in a dimmer light.

An example of the effect can be seen by placing a ball on a table and illuminating it from above. It will be seen that, while the upper part is brightly illuminated, the under part is shaded, and even when the ball is placed against a white background the shaded under side at once reveals that the ball is a spherical object.

If now the upper part of the ball be darkly colored there will tend to be an equalisation, for the upper part will appear somewhat of the same color as the shaded under portion, and the ball will tend to lose its spherical appearance. If it is placed against a dark background the illusion of the loss of roundness will be almost complete.

## EQUALISING LIGHT

It will be seen that darker tones plus more light on the upper portion will equalise the lighter tones plus shadow on the underside, and the coloring of animals is arranged to do just that. This is known as countershading.

The formation of the body has a relation to the amount of counter-shading required. This is exemplified in certain fish which have almost vertical sides. Here countershading is very slight, for the reason that strong countershading would defeat the purpose for which it is intended.

Some animals live in a subdued light and are therefore but slightly countershaded. On the other hand animals which live constantly in bright sunshine are very strongly countershaded.

## CATERPILLAR EXAMPLE

As an excellent example of selective countershading one might mention a caterpillar of the moth "Smerinthus Ocellatus," which rests in an inverted position. Here the countershading is also reversed, being dark underneath and light on the back.

While many creatures possess the simplest form of countershading by a gradual shading from dark on the illuminated side to light on the shaded side, others achieve the same result by means of patterns. These patterns take many forms and blend at short distances.

For instance, many spotted animals have the spots so arranged that the larger spots are on the back, while the spots get smaller on the sides and are absent on the underneath. Looked at from a distance, these spots blend and form a countershading.

In striped animals like the zebra the stripes are broad on the back, gradually tapering off down the sides and absent on the underparts.

According to Mottram, of London, various patterns found on animals blend at a distance and bring about obliterative countershading. He explained this by stating that when any pattern consisting of alternate light and dark bands or markings of any shape is looked at from various increasing distances a blending effect will take place at a certain point in which the separate markings are lost.

However, it is not by any means the rule that the background against which an animal has to live is of one unbroken color. Blades of grass have an outline, and logs and leaves and rocks display a shape and diversity of coloring which tends to nullify the effects of countershading.

Nature, then, must needs provide additional protection for her wild life. This is done in various ways, and perhaps the most common is that of color resemblance.

## GREEN FOR SAFETY!

We have all noticed the large number of green frogs, birds and insects which inhabit forest areas. Then there are green grasshoppers and snakes which live in grassy country.

On the other hand it will be noticed that those creatures which live on the ground in these areas have all acquired a brown coloring to conform to their surroundings.

The study of these creatures by infra red photography has opened up a field of research which may throw some light on the question of the possibility of some birds and animals having a color sense beyond the range normally enjoyed by human beings.

To human eyes the green colors of wild life would seem to provide a reasonable measure of protection against enemies. Yet infra red photography has shown a striking dissimilarity between various green animals.

## SUPERVISION

It has been found that different green animals show differences in their power of absorption of infra red light. Thus those animals with great absorptive properties show as dark objects on the photograph, while those of great reflecting properties of infra red show as light objects in the photograph.

Scientists are beginning to believe that some animals and birds — the owl, for example—have a range of vision beyond that of the human being at the infra red end of the spectrum, and that some green animals would be seen quite well by the owl and others would not. It is known that some animals such as the bat have a normal hearing range beyond that of the human being. Others have a sense of smell keener than the human, so that it is reasonable to suppose that others have a visual range beyond ours.

Thus it is that in assessing the behavior of animals we must not be led astray by judging by human standards.

A further remarkable quality of color resemblance is the ability of animals of the same species to adapt their colors to the environment.

# BIRD'S NATURAL CAMOUFLAGE

The shy wood thrush is hard to distinguish against its background of leaves and other foliage.

We find spiders of brown color living in brown bark of trees. Others of grey color living in stones. Still others of mottled appearance living in mottled surroundings.

This peculiarity is also often seen in birds. There is a crested lark living in Northern Africa which lives on the ground in open desert regions. In one area the earth is of a brown color and the larks are similar. In others places the ground is black volcanic. Here again the larks are similar, and so on. It has been possible to make a collection of several different colorings of these larks from as many places.

Again, many animals change their colors according to the seasons. Arctic foxes are an example among the animals, and some kinds of ptarmigan among the birds. These change from brownish hues in summer seasons to white in winter when snow abounds.

Some fish show a remarkable facility of being able to change color,

by Calvin Walters

and perhaps the most amazing example is the well-known flounder. The natural color of the flounder is a grey green with darker brown spots. Take him out of his natural surroundings and put him on sand and he will change in a very short while to a sandy color. Take him and put him on a muddy bottom and he changes again to a speckly black. P him on coarse gravel and he becom coarsely speckled.

Such things only leave us daze for the method by which it is do is not wholly understood. How t fish knows the color and by wh means the effects are rendered something which we have yet to fi out.

This property is not confined the flounder, for the classical cham lion does the same thing. He c change in a few minutes throu many colors from brown to green a red and many shades in between.

Another type of protecting color tion of animals is that known as d ruptive coloration. In this the pa tern tends to break up the outli of the animal and makes it a part the surroundings.

## PSYCHOLOGICAL

It seems that this effect depends both an optical and psychologic phenomenon. Optical in that the pa tern is so broken up that it is difficu to ascertain at first glance where t animal ends and where the su roundings begin.

The psychological factor is best e pressed in the words of Cott, a we known authority: "When the surfa of a fish . . . is covered with irregul patches of contrasted colors and ton these patches tend to catch the e . . . and draw the attention aw from the shape which bears the The patterns themselves may be co spicuous enough, but since they co tradict the form on which they a superimposed they concentrate atte tion upon themselves, and pass f part of the general environment."

In effect the disruptive patte

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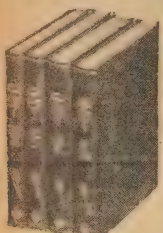

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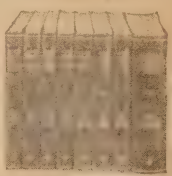

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makes it appear as though the observer were looking through the animal or bird to the landscape behind.

While countershading tends to reduce the solid appearance of animals, constructive shading does the opposite. It tends to give an appearance of something that is not present. This is, in the right place, just as effective a method as countershading.

Constructive shading makes use of optical illusions. For example, if the coloration proceeds gradually from dark to light an appearance of roundness will result. If light and dark alternate, the effect will be one of ridges.

Patterns are borne by some animals which make flat surfaces appear curved, hollow surfaces convex, and vice versa, and curved surfaces flat. Thus the true outline of the animal is concealed by distortion. In some cases, notably in butterflies and caterpillars, the creature looks distinctly like something else, such as a leaf of a tree.

### SHADOW FORECAST

Some creatures are possessed with powers of discrimination which enable them to determine in which direction their shadow will be cast by the sun. This knowledge enables them to orientate themselves so that their own shadow will be reduced to a minimum. The butterfly "Thecla rubi" is such a creature. Its wings are provided with the usual protective coloration, and in addition it always, on alighting, tilts its wings with respect to the sunlight so that the wings cover the greater part of its own shadow.

Other means of protection take the form of disappearing coloration where the bird, for instance, has red beneath the wings and grey on the surface. In flight the bird is very conspicuous, but on alighting the wings are folded back, thus hiding the red and displaying the grey. Puts one off the scent, so to speak.

Then there is concealment of body form where the animal or insect looks like a twig or a leaf or some other natural object.

In conclusion it will be observed that all the various forms of protective concealment in animals, birds, insects, fishes and reptiles depend on definite scientific principles, are not just accidental, but display a remarkable degree of efficiency for the special purpose to which they are put.

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## SCIENCE NOTES—Prof. A. M. LOW

***Science tells us that we cannot destroy anything, and that if yo burn a match and could destroy that match the whole balance o the world might be upset. For myself, I do not credit that it possible to think without our thoughts having some effect, becau energy cannot be destroyed and therefore the energy of thoug must go somewhere and do something.***

IT is only our ignorance that does not let us know what happens when we consign our friends to perdition. It is only prejudice that prevents us from teaching and publishing that a good thought has a definite effect. Yet it is a scientific argument which can be supported by normal logic.

There are many strange fancies which have now become partly true, and perhaps one of the most famous examples is that when we shout with rage the surrounding air is appreciably warmed. No one would have believed this a few years ago, yet it is capable of establishment by the use of definite electrical measuring instruments.

Thin wires stretched across a trumpet have their temperature raised by noise; the principle has been used in warfare for examining the noise of distant gunfire. What *I* want to know is what happens to this heat. It intrigues me also to think that the voice, ethereal emanations, and heat effects belonging to people who apparently died centuries ago are still wandering round the universe and contacting in some fashion with our own earth.

I am far too modest to believe that any thought of mine, or apparatus I might design, can be collected in the form of rappings upon the tables or jazzings on a tambourine.

### BIRDS AND BUILDINGS

I have been told that there is a building in a certain Southern State that is gradually crumbling to pieces from the attacks of birds upon its mortar. Birds can see very well, and I do not find it hard to believe that something in the mortar encourages the presence of insects which the birds try hard to dislodge in moments of before-dinner temper!

The real fact of the case is that if we knew the consequence and scientific details of each and every action or thought of which we seem to be capable, we might be so frightened of these consequences that we would never dare to think at all. But whether it is best to forget what might happen, by light, love, laughter and song, I will leave you to decide. A blackguardly thrush is pecking at my wall at the moment. Shall I save the building from physical destruction, or shall I think that the bird is beautiful and clever and lay up a little store of happiness by relying upon the everlasting value of mental effort?

When you snip off a piece of paper about 1in. long and ¼in. wide, or, indeed, any shape of this kind, it twirls rapidly as it falls. Sure you must have wondered why? Y would not take a queer thing li that for granted?

If that slip of paper be examin under a microscope it is never t same on both sides, nor is it ev quite straight. Nor, once again, the air in a room ever quite statio ary.

Due to any of these causes, t paper, as it drops, has an initi jerk of some kind, and this allo the air to slip more easily over o surface and one edge than tho which are opposite. The effe mounts up and away goes the pap twiddling for all it is worth. Litt things are not useless. Many obse vations of this kind were made the early aeronautical designe whose observations are embodied every plane that breaks the reco today.

### CROCKERY THAT SINGS

If ever you are staying at a ni old-fashioned hotel and in your roo is a china hand basin, fill it wi hot water and listen. It is ve likely that you will hear a gen singing sound like radio that h gone wrong.

Do not write to the Society f Psychical Research, but examine t surface of the old basin closely a you will see that it contains a lar number of hair-like cracks in t glaze. Water seeps slightly throu the first layer of glaze, causes the little pattern pieces to rub togeth as they expand and drive out t air which is contained beneath. Hen the singing.

It is a queer thing that air stic quite hard to solid surfaces. F example, when a match or cigare is thrown out of the car window. T match or cigarette seems to sta still for a moment because the sticks to the surface of the car. Wh electric light bulbs are evacuat quite a lot of air sticks, and if o has a few lead shot inside the bu and twirls it round and round, air actually released from the micr scopic irregularities in what to c eyes is a perfectly smooth surface.

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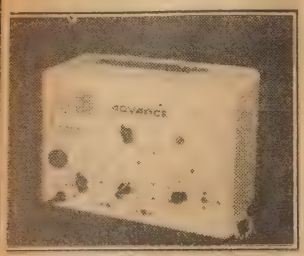

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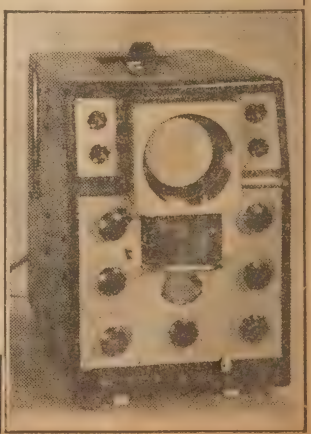

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# ATOM POWER THIS YEAR?

By MAURICE ENGLISH

**The writer, science and medicine editor of Pathfinder Magazine, in Washington, DC, was a senior staff editor on Kiplinger Magazine, handling articles on scientific research. During and immediately after the war, as chief of the Italian section of the Office of War Information, overseas branch, he inaugurated a special series of broadcasts on scientific subjects.**

WASHINGTON, January 3. — In the field of atomic energy, 1948 opens with a brilliant prospect—production of electric power from an atomic pile, like that which produced the bomb, is expected before its end.

Only a small amount of electric power will be generated. It will amount to one or two thousand kilowatts, enough to light and heat a few buildings and run an electric motor. This will be done on a purely experimental basis, as a guide to the engineers who are planning a pilot plant for getting electric power in quantities large enough for industrial uses.

Nevertheless, the generation of even 1000 kilowatts of electricity from an atomic pile will be a major milestone in atomic science. Up to now, only the by-products of atomic energy—radio-active isotopes used in medicine and chemistry—have been available for constructive purposes. On the day when heat from an atomic pile is pumped into a heat exchanger and then transformed in a generator into electric power, man will have harnessed the atom for useful work.

## MAY BE SOON

The experts, who are confident this day will come in 1948, are not so sure they know just where it will occur. Two groups, composed of atomic physicists and the new scientific category of nuclear engineers, are currently working on this major programme of the Atomic Energy Commission. One of them, headed by Dr. Walter H. Zinn, is at the Argonne laboratory, near Chicago. The second group, headed by Dr. Kenneth H. Kingdon, is working for General Electric—which, under Government contract, is building a 20,000,000-dollar atomic laboratory near Schenectady, N.Y. Either of the two might be first to come up with an actual demonstration of electric power from a pile.

The optimism of the experts who compose two groups is based on the success they have had in designing equipment and materials which, two years ago, existed only in the form of blueprints. For example, they have already solved one of their major problems by designing a new kind of pump capable of functioning indefinitely without repairs, while absorbing intense radiation of atomic particles and carrying several hundred degrees of heat. They have developed new substances, using hitherto unmanageable elements like fluorine, which are highly resistant to heat, corrosion and radiation.

On the basis of these successes, the nuclear engineers now are willing to sketch out a tentative timetable, which runs like this:—

Small quantities of electric power, produced for demonstration purposes, will probably be generated late in 1948.

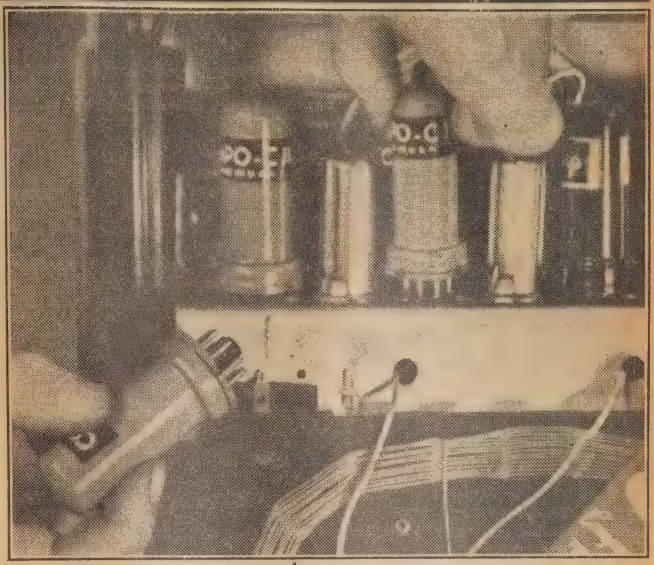
Large quantities, sufficient to be put to industrial use (though still only on an experimental basis), will be generated in 1950; with luck, in 1949.

## PILOT PLANT

A pilot plant will be functioning at the General Electric Knolls laboratory near Schenectady by 1952 This plant is expected to produce between 10,000 and 25,000 kilowatts of power. Even at the lower figure, this will be enough to supply the power needs of a city of several thousand people. It will consume only a small quantity of fissionable material per year, since uranium releases 3,000,000 times as much heat per pound as coal.

When will atomically-generated electric power be commercially available? The experts of the AEC are not willing to set a deadline for that. They think it's still a long way off. But by the end of this year they expect to have given us the first practical demonstration that some day we will have it.

# UNIT CONSTRUCTION FOR RADIO



The latest idea in radio construction in USA is by "throw-away" units. Circuit sections are included in plug-in units which replace normal wiring. These are colored for identification, and are discarded when a fault develops.

## British Big Planes Take Shape

(Continued from Page 7)

their views on this subject. Those are uninformed views, but the prejudice, if such it be, has been strengthened during the past few months by the survival of the Bermuda Sky Queen after a forced descent and the disappearance "without trace" of the Star Tiger at sea. Experience on British routes has also shown the high appreciation of space afforded to passengers by the flying-boat. The Shetland carries that quality a stage further . . . and the Saunders Roe boat will double it again.

There may be a chance later this year to let passengers try the Shetland on a relatively short route. As there is only one of the kind, it cannot economically be put on a long route with spares and special handling facilities at every halt. But it might be used during the holiday season between England and Sicily. It is fitted with seats for 40 passengers, and it has sleeping berths for 24 of that number. It could make a trip between England and Augusta non stop in less than eight hours.


# ROCKETING EVER HIGHER IN PUBLIC FAVOUR

It is now a widely accepted axiom that "a good radio *deserves* Philips Valves—and a so-so set really *needs* them." Philips Valves are designed and made to give *better listening for a longer time*—and every buyer of radio or radio parts knows how completely this objective has been achieved. No matter what type of receiver yours is, you'll find that Philips Valves put it right on top of its form.

# PHILIPS

## *VALVES*

PHILIPS ELECTRICAL INDUSTRIES OF AUSTRALIA PTY. LTD.

SYDNEY • MELBOURNE • ADELAIDE • PERTH • BRISBANE

WA-17

# TRANSMITTING PICTURES BY RADIO

THE apparatus at the sending analyses the picture according to the tone of each small segment. A photo-electric cell converts the light and dark portions into electric current proportional to the strength of the lights and shades.

As can be seen from the diagram-sketch here, a light is focused on to the picture, which is mounted on a drum and rotated at a uniform speed. A cylindrical screw moves the drum along in the direction of its axis.

With the machine in operation, a spot of light traces a close spiral as it moves over the surface of the photograph. The spiral path of the spot of light is very fine, covering 130 lines to each inch of the drum's length.

## THE SCANNER

A rotating disc (or scanner) perforated by holes near its circumference, is so arranged as to interrupt the light beam. The disc is rotated at such a speed that the beam is interrupted 1300 times a second, so that every second 1300 momentary light spots strike the photograph.

Light reflected from the photograph varies in intensity in accordance with the exact tone of the illuminated spot.

The reflected light is next concentrated on to a photo-electric cell, causing an intermittent current to flow in the cell circuit.

The electric impulses from the p-e cell are amplified before being passed on to the transmitter. The impulses are sent out on a carrier current from the aerial.

At the receiving station the weak current is picked up, amplified, and passed to an oscillograph mirror.

## OSCILLOGRAPH

The oscillograph is the most vital part of the receiving apparatus. It consists of a loop of wire suspended vertically under tension in a strong magnetic field and a small mirror attached to the two sides of the loop.

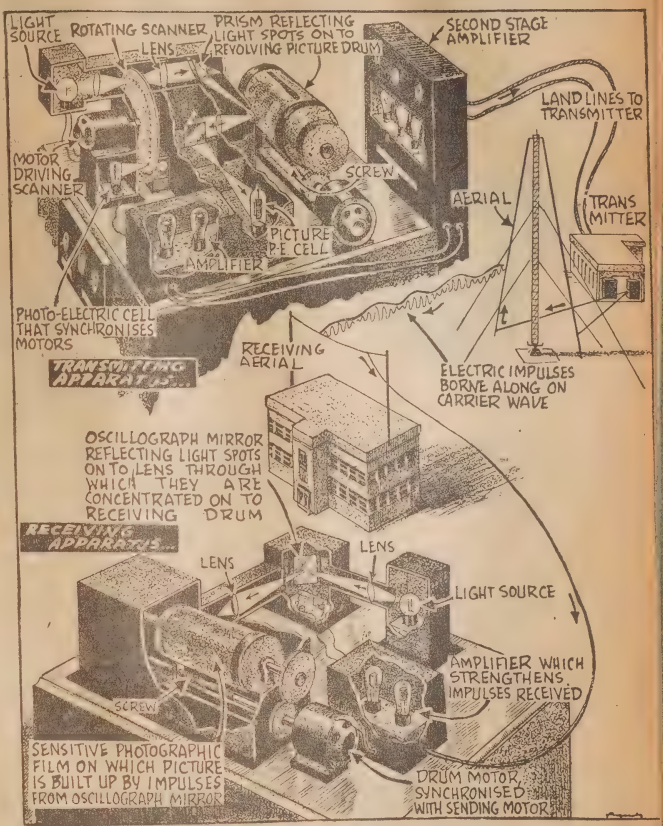
Light from the lamp shines upon the mirror, which reflects the light impulses through a slit fixed in front of a lens.

The fluctuating current from the amplified impulses is passed through the wires of the oscillograph, causing them to vibrate and give an oscillating movement to the mirror. This causes the beam of light to extend to varying distances across the slit, so that the amount of light varies in accordance with the impulses received by the mirror.

The changing beam is focused on to a strip of photographic paper mounted on a rotating drum, building up a replica of the original picture as the drum is moved along at steady speed.

So that both transmitter and receiving drums will be kept in unison at every revolution, a special photo-electric cell in the transmitting machine sends out a synchronising impulse which acts to "key up" the receiver.

Stripped of its technical detail, transmission of a picture by radio thus can be stated to be the dividir up of a picture into a series of fir lines of dots by means of a spotligl and the transformation of these do into impulses which at the receivin station are retranslated into spots lights to build up the picture on sensitive photographic plate.




Just as sound can be converted into electric impulses for transmission by telegraph or radio, so photographs can be similarly transmitted over long distances. Various methods are used in telegraphing or radioing a picture, but the principles are the same.

## RAILROAD EMPLOYS PORTABLE RADIOPHONE

PENNSYLVANIA Railroad has placed six portable inductive FM radiophones on two of its lines to extend the scope of the inductive telephone system used for several year. Operating on 80 kc, the 25lb. shoulder-strap units furnish communication from one train to another up to two miles or to way stations as far as 20 miles. A trainman may leave the immediate vicinity of h train and keep in constant touch wit it, with other trains nearby, or wit way stations. A trainman inspectir a disabled car can report the troub to either end of the train and issu instructions for corrective proced ures. News of the emergency cor dition can be swiftly relayed to dispatcher.

# NEWS AND VIEWS OF THE MONTH

## Amateurs on 144mc

THE news that amateurs have been granted the band from 144-148 mc in place of the present band from 166-170 mc has been received with great satisfaction.

The Atlantic City proposals include this band, so that the change was inevitable sooner or later. The prospect of building apparatus for this portion of the spectrum has been rather indefinite through lack of knowledge as to when the change-over would be likely to occur.

The news has removed this doubt, however, and amateurs can now prepare for activity, confident that their equipment will not require modification at some future date.

## Good band

WE can heartily commend this band to all amateurs who would welcome a break from working DX or rag-chewing on the lower frequency bands. It will be a somewhat easier band to work than 166, and yet it is high enough in frequency to represent a definite change in technique over the 50 mc band. It has been demonstrated many times that equipment for 50 mc need not differ very much from that used on other bands. But on 144 mc, long lines and so forth will be very much worth while, and even receiver design begins to call for revised ideas and circuitry for best results.

We hope it won't be long before the band around 450 mc will be made available in addition. This band, of course, is entirely different in all its aspects from the other two, and measurements become a matter of centimetres, rather than metres or feet. It is probably the best band of all for the experimenter, who can quite easily mount a complete transmitter and receiver, including a beam aerial, on the operating table if he wishes.

It is gratifying to see so many amateurs learning about and operating on the higher frequencies. There are infinitely more than before the war, and their ranks are growing every day.

## U.H.F. D.X.

It is highly probable that th long distance, Sporadic-E DX w have experienced in the last 1 months will begin to wane some what in the next year or two. Bu still more fascinating is the possi bility of long distance communica tion, as measured in hundreds o miles, due to extended ground wave temperature, inverson, &c.

This type of communication i not seriously affected by ionospheri disturbances, being more depender apparently on meteorological con ditions.

As an example of what can h

(Continued on Page 23)

## RADIO CROSSWORD PUZZLE No. 7

**ACROSS**

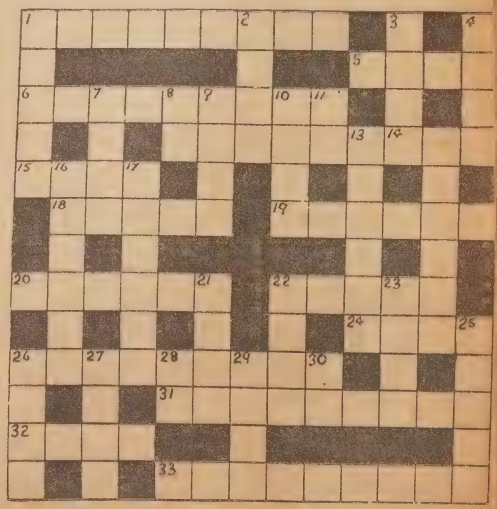
1—Essential to a superhet.
5—Heterodyne.
6—Regenerate.
12—Condenser.
15—Organs.
18—Fort testing.
19—Combining form for movable.
20—Tried out.
22—Stunned.
24—Uniform.
26—Opposition to current flow.
31—One who influences by wealth.
32—Kind of lamp.
33—For testing E.M.F.

**DOWN**

1—Filter.
2—Wave.
3—Check.
4—In the sky.
7—Centre.
8—Load compensator (abb.).
9—Den.
10—Plate circuit.
11—Electric current (abb.).
13—Make gas conductive.
14—Type of converter.
16—Unit of current.
17—Interference.
21—Station indicator.
22—Canal.
23—Always.
25—Saltpetre.
26—Kind of circuit.
27—Smallest particle.
28—Triode plate (abb.).
29—Least.
30—Electron oscillator (abb.).

**BELOW: LAST MONTH'S SOLUTION**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | E | A | R | S | | A | B | I | O | | |
| | L | | O | | C | | L | | P | | |
| E | L | E | C | T | R | O | M | E | T | E | R | S |
| L | | C | | O | | I | | E | | N | | O |
| L | A | T | E | R | A | L | | D | A | R | A | F |
| S | | R | | | | S | | E | | A | | T |
| | W | I | R | E | S | | P | R | O | D | S | |
| G | | C | | L | | S | | | | I | | S |
| R | I | F | L | E | | P | A | N | C | A | K | E |
| A | | L | | C | | A | | I | | T | | T |
| F | L | U | T | T | E | R | E | C | H | O | E | S |
| | | T | | R | | K | | E | | R | | |
| | | D | R | O | P | | E | R | G | S | | |



# KEEP THIS

## For Future Reference

Many thousands of Kingsley illustrated catalogues have been distributed throughout Australia and requests are still being received in great numbers. Owing to the dearth of suitable paper, it has not been possible to reprint the catalogue and we therefore present here the full list of Kingsley Radio Components as it appears in that publication. Tear this page out and retain for reference.

| Cat. No. | Type No. | DESCRIPTION |
|---|---|---|
| | | **"PERMACLAD" & "PERMACORE" INTERMEDIATE FREQUENCY TRANSFORMERS** |
| 1 | KIF 1 | No. 1 455 kc. Autodyne "Permaclad" (Shield Can 3" x 1⅜") |
| 2 | „ 2 | No. 1, 175 kc. Autodyne "Permaclad" (Shield Can 3" x 1⅜") |
| 3 | „ 3 | No. 2, 175 kc. Standard replacement type (Shield Can 3" x 1⅜") |
| 4 | „ 4 | No. 2, 175 kc. "Permacore" (similar to KIF 3) (Shield Can 3" x 1⅜") |
| 5 | „ 5 | Standard No. 1, 455 kc. Hi-gain and selectivity (Shield Can 3" x 1⅜") |
| 6 | „ 6 | Standard No. 2, 455 kc. Hi-gain and selectivity (Shield Can 3" x 1⅜") |
| 7 | „ 7 | No. 1, 455 kc. (alternative KIF5) |
| 8 | „ 8 | No. 2, 455 kc. (alternative KIF6) |
| 9 | „ 8a | No. 2, 455kc. (alternative KIF6) *(Manufacturer's type "Permacore" Hi-gain but with an extended band width.)* |
| 10 | „ 9 | No. 1, 1.9 mc. 2 pye "Permacore" |
| 11 | „ 10 | No. 2, 1.9 mc. 2 pye "Permacore" *(for 2 stage I.F. channel use 2 x KIF9 with 1 x KIF10.)* |
| 12 | „ 11 | No. 1, 455kc. Low gain |
| 13 | „ 12 | No. 2, 455 kc. Low gain *(for 2 stage I.F. channel use 2 x KIF11 with 1 x KIF12.)* |
| 14 | „ 13 | No. 1, or 2 175 kc. "Permacore" type. |
| 15 | „ 14 | Standard No. 1 Miniature 455 kc. "Permaclad" (Can 1⅞" x ⅞" sq.) |
| 16 | „ 15 | Standard No. 2 Miniature 455 kc. "Permaclad" (Can 1⅞" x ⅞" sq.) |
| 17 | „ 16 | Standard No. 2 Miniature 455 kc. Tuned pri. untuned Sec. (Special) |
| 18 | 17 | Manufacturer's No. 1 "Permaclad" solid wire type. |
| 19 | „ 18 | Manufacturer's No. 2 "Permaclad" solid wire type. |
| 20 | „ 19 | No. 1 Hi-gain special manufacturer's type "Permaclad" |
| 21 | „ 20 | No. 2 Hi-gain special manufacturer's type "Permaclad" |
| 22 | „ 21 | Hi frequency No. 1 (F.M.) 10.7 mc. |
| 23 | „ 22 | Hi frequency No. 2 (F.M.) 10.7 mc. *(for 2 stage I.F. channel use 2 x KIF21 and 1 x KIF22.)* |
| 24 | „ 23 | Crystal Filter 455 kc. Input Transformer |
| 25 | „ 24 | Crystal Filter 455 kc. Output Transformer |
| 26 | „ 25 | Crystal Filter 1.9 mc. Input Transformer |
| 27 | „ 26 | Crystal Filter 1.9 mc. Output Transformer |
| | | **"PERMACLAD" AND "PERMACORE" BROADCAST COILS** |
| 28 | KC 1 | Standard B/C Aerial Coil "H" Gang—use with Permaclad 455 kc. I.E. |
| 29 | „ 1a | B/C Aerial Coil for Car Radio—use with Permaclad 175 kc. I.E. |
| 30 | „ 2 | Standard R.F. Coil "H" Gang—use with Permaclad 455 kc. I.E. |
| 31 | „ 2a | R.F. Coil Car Radio—use with Permaclad 175 kc. I.E. |
| 32 | „ 3 | Standard Osc. Coil "H" Gang Valves—use with Permaclad 455 kc. I E. ECH35, 6A8, 6J8, EK2, etc. Padder 430 mmf. |
| 33 | „ 4 | Standard "F" Gang—all other particulars as for KC 1, 2 & 3; Padder 430 mmf. |
| 34 | „ 5 | |
| 35 | „ 6 | |
| 36 | „ 7 | B/C Autodyne—use with "Permaclad" 455 kc. Padder 430 mmf. |
| 37 | „ 8 | B/C Osc. "H" Gang—use with "Permaclad" 175 kc. IF. Padder 840 mmf. Valves 6A8, 6J8, etc. Autodyne or Octode Converter. |
| 38 | „ 9 | B/C "Reinartz" with "Hi-"Z" Primary and tappings for long and short aerial. |
| 39 | „ 10 | B/C R.F. Coil with reaction and Hi-"Z" Primary. |
| 40 | „ 11 | B.F.O. Coil, 455 kc. (Hartley circuit) |
| 41 | „ 12 | Wave Trap, 455 kc. |
| 42 | „ 13 | B/C Osc.—use with "Permaclad" 455 kc. I.F. Valve 6SA7, Padder 430 mmf. |
| 43 | „ 14 | Miniature B/C Aerial "Permacore" unshielded (Replacement type) |
| 44 | „ 15 | Miniature B/C Aerial "Permacore" unshield-placement type) Padder 430 mmf. |
| 45 | „ 16 | B/C Aerial "H" Gang "Permacore" 3-section Secondary (manufacturer's type) |
| 46 | „ 17 | B.F.O. Coil, 1.9 mc.—use with 6J8, 6C8, etc. (Hartley circuit) |
| 47 | „ 18 | B/C Osc. 1.9 mc.—use with 6J8, 6C8, etc. (Hartley circuit), Padder 115 mmf. |
| 48 | „ 19 | Standard Mini. B/C Aerial (Can size ⅞" x ⅞" x ⅞") |
| 49 | „ 20 | Standard Mini. B/C R.F. (Can size ⅞" x ⅞" x ⅞") |
| 50 | „ 21 | Standard Mini. B/C Osc. (Can size ⅞" x ⅞" x ⅞"), Padder 430 mmf. |
| | | **"PERMACORE" SHORT WAVE COILS** |
| 51 | KCH 1 | S/W Aerial Coil "H" Gang 13-42 Metres. |
| 52 | „ 2 | S/W R.F. Coil "H" Gang 13-42 Metres. |
| 53 | „ 3 | S/W Osc. Coil "H" Gang 13-42 Metres, 6J8 Converter Padder .004 mfd. |
| 54 | „ 4 | S/W Aerial Coil "H" Gang 16-50 Metres. |
| 55 | „ 5 | S/W R.F. Coil "H" Gang 16-50 Metres. |
| 56 | „ 6 | S/W Osc. Coil "H" Gang 16-50 Metres, 6J8 Converter Padder .004 mfd. |
| 57 | „ 7 | S/W Osc. Coil "H" Gang 16-50 Metres, EK2 Converter-Padder .004 mfd. |
| | | **"FERROTUNE" FOUNDATION KIT SETS INCLUDING DIAL, CHASSIS & I.F.T.'s.** |
| 58 | KFT 1 | B/C "Ferrotune" Kit Set, 4/5 Valve Table Model. |
| 59 | „ 2 | B/C "Ferrotune" 2/3 Valve "Reinartz" Kit Set—Mantel Model. |
| 60 | „ 3 | B/C "Ferrotune" Kit Set, 3/4 Valve Mantel Model. |
| 66 | KF/HB | B/C "Ferrotune" Hi-fidelity type using 1.9 mc I.F.T.'s. |
| | | **"FERROTUNE" CONVERTERS.** |
| 67 | KF/C610 | Hi-frequency Converter covering 6 or 10 metres with I.F. injection at 10.7 mc. |
| | | **"FERROTUNE" VARIABLE FREQUENCY OSCILLATOR (E.C.O.)** |
| 68 | KF/VFO | A stable VFO for "Ham" use covering 80-40-20-10-6 Metres. (Available later). |
| | | **"FERROTUNE" PRE-SELECTOR** |
| 69 | K/S9er | Specially developed for Aerial to Receiver matching, plus high gain and high signal-to-noise ratio. Covers the 6 or 10 metre bands. A MUST for every "Ham" or S.W.L. |
| | | **DUAL WAVE UNITS—CONDENSER TUNED.** |
| 70 | KU 1 | Dual Wave Unit (without R.F.) 13-42 metres. |
| 71 | „ 2 | Dual Wave Unit (without R.F.) 16-50 metres. |
| | | **DIALS—"FERROTUNE" TYPES.** |
| 72 | KDU 1 | B/C Dial edgelit—table model type 6" x 4½" |
| 73 | „ 2 | "Reinartz" 2⅞" square—no station call signs. |
| 74 | „ 3 | B/C Dial 2⅞" square—N.S.W. and Q'land (Capital Stations shown) |
| 75 | „ 4 | B/C Dial 2⅞" square—S.A. and W.A. (Capital Stations shown) |
| 76 | „ 5 | B/C Dial 2⅞" square—Vic. and Tas. (Capital Stations shown) |
| 77 | „ 6 | B/C Dial 2⅞" Console Model. |
| 78 | „ 7 | B/C Dial 2⅞" Miniature floodlit slide rule 4⅛" x 2⅞" window. |
| | | **LOOP AERIALS.** |
| 79 | K/L 2 | Mini. loop aerial for portables Hi-"Q" with Primary winding built in for external aerial and earth connections if required. |
| | | **SPEAKERS.** |
| 80 | K/R 3 | 3" Permag. Dynamic Speaker |
| 81 | K/R 5 | 5" Permag. Dynamic Speaker |
| 82 | K/R 6 | 6" Permag. Dynamic Speaker *(each available with input transformer of requisite impedance.)* |

done, it might be mentioned that for a number of months now, VK2JU in Sydney and VK2GU in Canberra, have maintained regular schedules, day and night, over a 150-mile path, and have never failed to make contact. Signals at each end have many times exceeded S8, the only flaw being a tendency to severe fading at times. Between Young and Sydney, 2JU and 2TA have made many contacts, and at least one other station, 2NP, has contacted Young. VK2GU has worked with VK2BZ in Newcastle, about 220 miles, while cross-country contacts between 2TA, 2GU and 2PN in Tumut have been made. In Victoria, many stations have worked over distances up to and exceeding 100 miles.

The moral of all this is that the higher frequencies should not be considered of purely local interest. Improvements in equipment, particularly in aerials, should allow almost anyone to make contact outside the metropolitan areas. We hope these instances will encourage even more amateurs to populate the bands.

## Radar to the moon

We note that once again the CSIR has succeeded in obtaining radar echoes from the moon, in the course of their examination of the ionosphere.

It will be remembered from our article of a few issues ago that only certain days in each month bring the moon into the field of the aerials at the right time for the experiment to be carried out. Which doesn't help very much in keeping the work going.

Maybe results will soon justify the erection of special equipment for the job, which is free from these limitations.

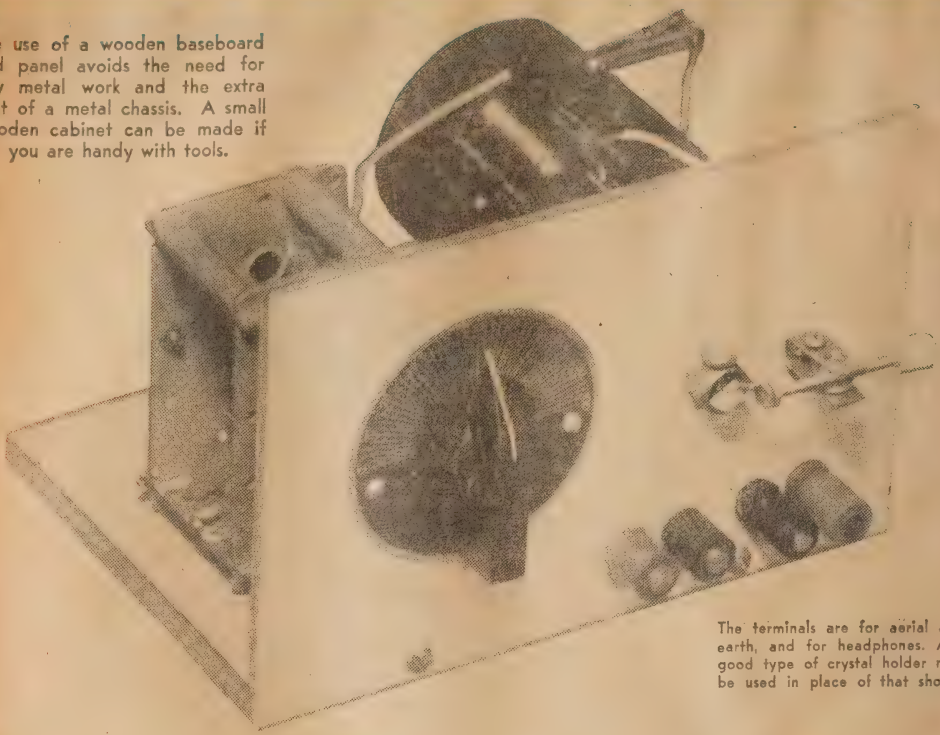
It would be of great assistance to those attempting to add something more to our knowledge of this important matter.

## W.I.A. Convention

The Wireless Institute of Australia's annual convention will have taken place in Melbourne by the time these notes are published. Major item on the agenda is discussion of the Federal Constitution, which so far does not include a section covering the operation of local divisions. It is to be hoped that before the job of producing a Federal document is considered complete, this part will be added, thus presenting a comprehensive platform upon which the whole body may function and grow.

The agenda items generally reflect the more stable conditions under which amateurs are now operating. They show clearly that settlement of its own affairs is the biggest job on hand.

The use of a wooden baseboard and panel avoids the need for any metal work and the extra cost of a metal chassis. A small wooden cabinet can be made if you are handy with tools.



The terminals are for aerial an earth, and for headphones. Any good type of crystal holder may be used in place of that shown.

# Radio's Simplest Set

All kinds of people read Radio and Hobbies, ranging from very clever and well-informed radio men to young chaps who are just beginning to discover what radio is all about. Sometimes I feel that we don't pay as much attention as we should to the real beginner — the lad who has just realised the difference between a coil and a condenser and who would like to do something about it.

by John Moyle

I CAN remember as though it were yesterday the first radio set I ever built, although I'm afraid it's a good deal farther back than yesterday. I can remember the problems I came up against, and the questions I wanted to ask. Some of them were pretty silly when I think of them now, but very important to me at the time.

My first was a crystal set, built on a wooden base-board and a shellacked three-ply panel. It had a whopping big coil with taps all over it, and a couple of switches with which the stations were tuned. The switches were made of two switch arms and a number of studs, all mounted directly to the panel. I made up my crystal holder with a number of arms, each fitted with cats-whiskers of different metals—copper, brass, and allegedly silver and gold. I'm afraid the last two had very little of either metal in them. The idea was to pick the one which gave best results, although I couldn't tell any difference between them.

Although time has passed on since those days the crystal set is still the simplest type anyone can build. It has very few parts and you are pretty certain to get some kind of signals if you are anywhere near local stations—say 10 or 15 miles.

Some people have heard signals farther than that, but everything must be on your side if such reception is to be certain.

There is also one very good point in favor of a crystal set. It needs no batteries, and so has no upkeep costs. Once built it will run on indefinitely without costing anything more than a listener's licence. And if you are a young lad who has built this set just for experiment and your Dad already has a licence for a set you won't need to pay for another one. Only if you intend to keep it built up as a permanent installation is another licence required for it.

The disadvantages of a crystal set are first of all poor selectivity and, secondly, low volume.

## SELECTIVITY

Selectivity, of course, is the term we apply to a set's ability to separate the various stations when tuning in. The crystal set isn't very good at this. If you are close to two or more local stations—say two miles or so—you may find that one tends to butt in on reception of the others.

It is quite possible to arrange for adjustments which will make the tuning sharper, but they all tend to reduce the volume of the signals, so that we can only partly compensate for lack of sharpness, otherwise signals become too weak.

At best, a crystal set gives only good headphone strength signals. This is because the crystal, unlike a valve, cannot amplify the signals. The only energy we have to work the phones is that actually picked up by the aerial and fed down into the set. If your crystal is a good one it will make good use of this energy and you get loud signals. If it is a poor crystal, or poorly adjusted, signals will be so much weaker.

There is one good point about all this, however. Most people today who build crystal sets are quite happy if they can get good reception from one or two stations without interference.

In practically any locality this should be possible. In the old days, when only three or four stations were on the broadcast band, it wasn't hard to separate them. Today there are twice as many, so we mustn't grumble if we get a bit of interference here and there, or find some of the stations are weakened in our adjustments to get reasonable selectivity.

## INEXPENSIVE

Lastly, a crystal set is about the cheapest of all to build. There are very few parts, and some of these can be picked up in junk stores very cheaply. Even if they are old they will probably work quite all right if they are not actually faulty.

Now, in describing how to build this crystal set, I am deliberately putting myself in your place, just where I was say 25 years ago. To me a condenser was just an assembly of metal plates and a spindle, and I knew only vaguely what a microfarad was. You needn't tell this to our technical editor, but you don't need to know a microfarad from a peanut to make a simple set. So right from the start we'll decide to leave our technical terms completely out of it, except where we have to quote them so that you'll know what to ask for when getting your bits and pieces together.

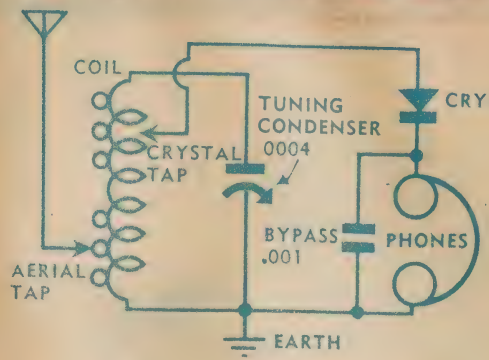
The main components of a crystal set are, firstly, a panel and baseboard; secondly, a tuning condenser; thirdly, a tuning coil; and, lastly, a crystal detector. Headphones and four terminals just about complete the list of parts.

## TUNING

The earliest crystal sets did not use a tuning condenser. Their tuning was brought about by winding a coil rather larger than was needed to tune in the station on the longest wave-length. The coil was tapped at each ten turns, and the last ten turns at each turn. By using a pair of switches, that allowed the operator to select just the right number of turns to bring in the station required. Sometimes the insulation of the coil was bared so that a slider could be moved over its length, and the correct turns "tapped" off rather more conveniently than by using switches.

The same effect of tuning can be obtained by using a coil which will "tune" normally to a wave-length shorter than that required, and then connecting a variable condenser right across the coil. As the plates of the condenser are brought into mesh the same tuning effect is obtained as though more turns were being added to the coil. This is the tuning method generally used today, as it is much more convenient than winding a coil with many tappings. Switches, too, are just about as expensive as a simple tuning condenser. There are one or two other advantages of the condenser which we needn't bother about now. The main thing to remember is that varying the number of turns has the same general ef-

## THE "CRYSTAL KING" CIRCUIT




R & H "CRYSTAL KING"

The circuit is the best for all-round use of those which have been employed for many years.

## PARTS LIST

1 Panel—7 x 4¾ three-ply or masonite.

1 Baseboard—7 x 4¾ x ½in. wood.

Tubing—cardboard or other insulating material 4 inches long and between 2 and 3 inches diameter.

Winding wire—4oz. enamelled or cotton covered copper wire between 20 and 26 gauge, 24 gauge probably the best.

Tuning condenser—any type in good order with a capacity (maximum) of between .0004 and .0005 microfarads.

Crystal Detector—Either type shown in pictures, or similar to them. A crystal will be needed unless one is supplied with the holder.

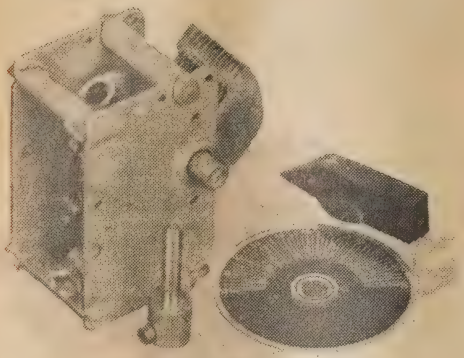
By-pass—Mica condenser of .001 microfarads—not always required.

Headphones—Preferably of 2000 ohms impedance, although ex-Disposals low impedance types are useable if signal strength is good.

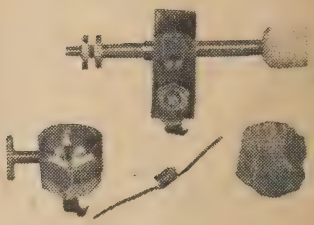
Sundries—Knob and scale for tuning; four terminals; screws for mounting panel, condenser, and coil; two clips for coil taps.

Aerial—Unused winding wire may be used.

# COMPONENTS FOR THE CRYSTAL KING

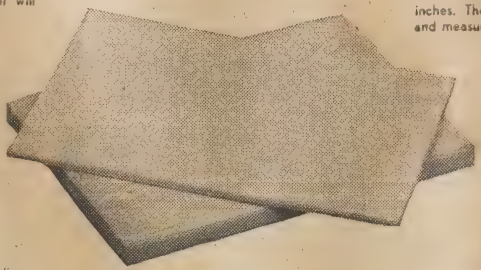


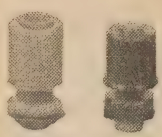
Below are seen the crystal detector parts—the adjusting arm, the crystal cup, the catswhisker, and the crystal itself.



A modern tuning condenser, with a control pointer, extension spindle (if required) and scale. Old-style tuning condensers in good order will work just as well.

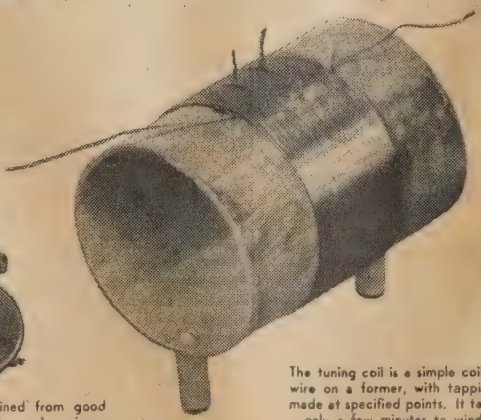
The baseboard is a piece of ¼-inch wood measuring five by seven inches. The panel is made of 3-ply and measures 4¼ by seven inches.





Four terminals like these are needed. All-metal terminals will do if mounted on a wood panel.

Best results will be obtained from good high impedance headphones. Low impedance "disposals" types will need a special transformer for best results.



The tuning coil is a simple coil of wire on a former, with tappings made at specified points. It takes only a few minutes to wind.

# Price List

## of R.C.S. Radio Pty. Ltd.

174 CANTERBURY RD., CANTERBURY, N.S.W.

## COMPONENTS

### INTERMEDIATE TRANSFORMERS

Standard 460 k.c.

| | |
|---|---|
| IF162 1st Stage Permature Iron Core | 13 9 |
| IF163 2nd Stage Permature Iron Core | 13 9 |
| IF164 Low Gain Permature Iron Core | 13 9 |

Standard 175 k.c.

| | |
|---|---|
| IE74 1st Stage Permature Iron Core | 13 9 |
| IE75 2nd Stage Permature Iron Core | 13 9 |

### MAGNASONIC INTERMEDIATE TRANSFORMERS

Dimensions 2" x 1" Round.

| | |
|---|---|
| IF168 Midget Iron Core Permature 1st | 12 6 |
| IF169 Midget Iron Core Permature 2nd | 12 6 |

### MIDGET MAGNASONIC BROADCAST COILS

Dimensions 1" x 1" Round.

| | |
|---|---|
| E352 Iron Core Aerial | 6 6 |
| E353 Iron Core R.F. | 6 6 |
| E354 Iron Core Osc. | 6 6 |
| E355 Iron Core Osc. 6SA7 Valve | 6 6 |

### STANDARD SUPERHET. COILS

Dimensions 1 3-8" x 2" square.

| | |
|---|---|
| E342 Air Core H. Gang Aerial Coil | 6 6 |
| E343 Air Core H. Gang R.F. Coil | 6 6 |
| E344 Air Core H. Gang Osc. Coil | 6 6 |
| E345 Iron Core Permature H. Gang Aerial Coil | 8 6 |
| E346 Iron Core Permature H. Gang R.F. Coil | 8 6 |
| E347 Iron Core Permature H. Gang Osc. Coil | 8 6 |
| E348 Iron Core Permature H. Gang Osc. Coil, 6SA7 Valve | 8 6 |

### T.R.F. COILS

| | |
|---|---|
| T81 Air Core H. Gang Reinartz Coil | 5 6 |
| T82 Air Core H. Gang Reinartz Coil in Can | 6 6 |
| T87 Air Core H. Gang R.F. with Reaction Coil | 6 6 |
| T88 Air Core H. Gang Aerial Coil | 6 6 |
| T89 Air Core H. Gang R.F. Coil | 6 6 |

### LOOP AERIAL COILS

| | |
|---|---|
| F125 Standard 6" Diam. | 7 6 |
| F126 Midget 4" Diam. | 7 6 |

### SHORT WAVE COILS

13 to 42 Metres.

| | |
|---|---|
| H121 Iron Core Permature Aerial Coil | 5 0 |
| H122 Iron Core Permature R.F. Coil | 5 0 |
| H123 Iron Core Permature Osc. Coil | 5 0 |

### 5-BAND SHORT WAVE & BROADCAST COILS

| | |
|---|---|
| H124 10m. Aerial | 4 6 |
| H125 10m. R.F. | 4 6 |
| H126 10m. Osc. | 4 6 |
| H127 20m. Aerial | 4 6 |
| H128 20m. R.F. | 4 6 |
| H129 20m. Osc. | 4 6 |
| H130 40m. Aerial | 4 6 |
| H131 40m. R.F. | 4 6 |
| H132 40m. Osc. | 4 6 |
| H133 80m. Aerial | 4 6 |
| H134. 80m. R.F. | 4 6 |
| H135 80m. Osc. | 4 6 |
| H136 B'cast Aerial | 5 6 |
| H137 B'cast R.F. | 5 6 |
| H138 B'cast Osc. | 5 6 |

### COIL KITS

| | |
|---|---|
| K116 Standard Personal Coil Kit | 2 2 0 |
| K117 Standard 4/5 Dual Wave Coil Kit (complete with I.F.'s) | 2 19 0 |
| K118 Midget Per. Coil Kit | 1 19 6 |
| K119 Midget B/C Coil Kit | 1 18 0 |

### RADIO FREQUENCY CHOKES

| | |
|---|---|
| RF81 Silk Honeycomb R.F. | 1 9 |
| RF82 3 pie 1.7 M/H R.F. | 4 6 |
| RF83 4 pie 2.5 M/H R.F. | 4 6 |
| RF84 5 pie 4.0 M/H R.F. | 4 6 |
| RF85 6 pie 7.0 M/H R.F. | 4 6 |
| RF86 Cotton Honeycomb R.F. | 1 6 |
| RF106 Vibrator Low Tension R.F. | 4 3 |

### LINE FILTER COIL

| | |
|---|---|
| RF15 Line Filter Coils | 11 0 |

### DUAL WAVE UNITS

| | |
|---|---|
| DW29 Standard 4/5 Dual Wave Units | 1 14 0 |

### LOW LOSS COIL LACQUER

| | |
|---|---|
| KH34 Type | 2 6 |

### COIL FORMERS

| | |
|---|---|
| 1.24 6-Pin Plug in 1¼" Diam. | 3 3 |
| 1.25 6-Pin Plug in 1½" Diam. | 3 5 |

### DIALS

| | |
|---|---|
| DA7 D/W Portable Kit Dial | 9 0 |

### FILTER CHOKES

| | |
|---|---|
| TC60 100 M/A 30 Henries 250 ohms D.C. Res. | 13 6 |
| TC65 50 M/A 30 Henries 400 ohms D.C. Res. | 13 6 |
| TC80 150 M/A 30 Henries | 1 1 0 |
| TC81 200 M/A 30 Henries | 1 5 0 |
| TC66 60 M/A 20 Henries 650 ohms D.C. Res. | 10 0 |

### AUDIO CHOKES

| | |
|---|---|
| TA4 100 Henries 1000 ohms D.C. Res. 25 M/A | 1 8 6 |

### FIVE-IN-ONE TRIMMER

| | |
|---|---|
| CG19 four-2 plate and one-3 plate | 3 6 |

### VIBRATOR CHOKES

| | |
|---|---|
| TC58 Low Tension 3 Amps 50 M/H .5 ohm D.C. Res. | 15 0 |
| TC70 High Tension 50 Henries 450 ohm D.C. Res.. 75 M/A | 15 0 |

### FILAMENT TRANSFORMERS

| | |
|---|---|
| TP1 2.5 volts 2 Amps 7 Watt | 11 6 |
| TP2 4 volts 1 Amp 7 Watt | 11 6 |
| TP3 6.3 volts .3 Amps 7 Watt | 11 6 |
| TP55 6.3 volts 3 Amps 15 Watts | 14 6 |

### VIBRATOR TRANSFORMERS

| | |
|---|---|
| TP81 135 volt, 6 volt | 17 6 |

### AUTO TRANSFORMERS

| | |
|---|---|
| TP80 6.3 volt, 4 volt and 2.5 volt | 11 6 |

### SPEAKER TRANSFORMERS

| | |
|---|---|
| TS23 Single Low Impedance Triode | 10 0 |
| TS24 Single High Impedance Triode | 10 0 |
| TS 25 Push Pull Low Impedance Triode | 10 6 |
| TS26 Push Pull High Impedance Triode | 10 6 |
| TS27 Single Low Impedance Pentode | 10 0 |
| TS28 Single High Impedance Pentode | 10 0 |
| TS29 Push Pull Low Impedance Pentode | 10 6 |
| TS30 Push Pull High Impedance Pentode | 10 6 |

### AUDIO TRANSFORMERS

| | |
|---|---|
| TB42 A Class single Ratio 3 to 1 | 1 1 0 |
| TB43 A Class Push Pull Ratio 3 to 1 | 1 2 6 |
| TB44 B Class Push Pull Ratio 1½ to 1 | 1 1 0 |

### DIAL DRIVE DRUMS

| | |
|---|---|
| MO8 Dial Drive Drum, complete with screws, springs and cord | 3 3 |

### SPEAKER TRANSFORMER REPLACEMENT COILS

| | |
|---|---|
| F132 Single Low Impedance Triode | 5 6 |
| F133 Single High Impedance Triode | 5 6 |
| F134 Push Pull Low Impedance Triode | 5 6 |
| F135 Push Pull High Impedance Triode | 5 6 |
| F136 Single Low Impedance Pentode | 5 0 |
| F137 Single High Impedance Pentode | 5 0 |
| F138 Push Pull Low Impedance Pentode | 5 6 |
| F139 Push Pull High Impedance Pentode | 5 6 |

### LINE FILTERS

| | |
|---|---|
| LF20 Line Filter .75 amps | 1 1 0 |
| LF21 Line Filter 3 amps | 1 17 6 |

### CENTRE TAPPED RESISTORS

| | |
|---|---|
| 10, 20, 30, 75, 100 and 200 ohms | 1 0 |

### WIRE WOUND RESISTORS

| | |
|---|---|
| 0 ohms to 1500 ohms, 100 M/A | 1 0 |
| 1500 ohms to 2500 ohms, 50 M/A | 1 2 |
| 25000 ohms to 10000 ohms, 25 M/A | 1 2 |
| 1000 ohms Field Replacement | 4 0 |

### TRIMMING CONDENSERS

| | |
|---|---|
| CG15 2-plate | 1 0 |

### R.C.S. VOLTAGE DIVIDERS

| | |
|---|---|
| VD25 15000 ohms 2 variable clips | 5 6 |
| VD28 25000 ohms 2 variable clips | 5 6 |

### PADDING CONDENSERS

| | |
|---|---|
| P21 460 K.C. | 2 6 |
| P22 262 K.C. | 3 0 |
| P23 175 K.C. | 3 0 |

### POTENTIOMETER AND RHEOSTATS

| Type | Ohms | M/A | Price |
|---|---|---|---|
| PT40 | 6 | 250 | 5 0 |
| PT38 | 10 | 250 | 5 0 |
| PT39 | 20 | 250 | 5 0 |
| PT34 | 30 | 250 | 5 0 |
| PT46 | 400 | 50 | 5 0 |
| PT47 | 1000 | 35 | 5 0 |
| PT49 | 2500 | 30 | 5 0 |
| PT51 | 5000 | 30 | 5 0 |
| PT52 | 10000 | 20 | 5 0 |

### MIDGET VARIABLE CONDENSERS

Star Type with Face Support.

| Type | mmfd. | Plates | Price |
|---|---|---|---|
| CV34 | 10 | 2 | 4 0 |
| CV35 | 15 | 3 | 4 3 |
| CV36 | 25 | 4 | 4 6 |
| CV37 | 35 | 5 | 4 9 |
| CV38 | 50 | 7 | 5 3 |
| CV39 | 70 | 9 | 5 10 |
| CV40 | 100 | 14 | 6 6 |

### MIDGET VARIABLE CONDENSERS

M.C. Type with Face and Back Supports.

| Type | mmfd. | Plates | Price |
|---|---|---|---|
| CV41 | 10 | 2 | 7 3 |
| CV42 | 15 | 3 | 7 9 |
| CV43 | 25 | 4 | 8 4 |
| CV44 | 35 | 5 | 9 0 |
| CV45 | 50 | 7 | 9 6 |
| CV46 | 70 | 9 | 10 0 |
| CV47 | 100 | 14 | 11 3 |

### RESISTANCE STRIPS

| | |
|---|---|
| MS7 x 25 12½" long, 25 lugs per side | 3 6 |
| MS8 ½" wide—any lengths per inch | 1½d |
| MB1 Anchor Strip | 3d |

### TRANSPOSITION BLOCK

| | |
|---|---|
| AF12 Set of eight | 5 6 |

### MAGNETITE FE304 IRON CORES

| | |
|---|---|
| MO1 3-8" per 100 | 2 0 0 |
| MO2 7-16" per 100 | 2 0 0 |
| MO3 ½" per 100 | 2 0 0 |
| MO4 9-16" per 100 | 2 0 0 |
| MO5 ¾" per 100 | 2 0 0 |

### SOLDER LUGS

| | |
|---|---|
| SL3 Single ended per 1000 | 10 0 |
| SL4 Pear-shaped per 1000 | 10 0 |
| SL5 Double-ended per 1000 | 10 0 |

### 6-PIN COIL PLUGS

| | |
|---|---|
| 1.27 1¼" | 1 3 |
| 1.28 1½" | 1 3 |

### DIAL SPINDLE

| | |
|---|---|
| K1 Dial Spindle | 2 0 |

### CLEAR POLYSTYRENE TUBING

| | |
|---|---|
| MO16 2 1-8" long x 1¼" diam. | 1 3 |
| MO17 2 1-8" long x 1¼" diam. | 1 3 |

fect in tuning as varying the setting of the tuning condenser, and we could tune our set by either method.

If you look at the picture of the tuning coil, and the circuit diagram which shows it as the radio engineer draws it, you will see that it has five tappings. These, however, are not there for the purpose of tuning. A few words will be enough to explain why they are used.

You will remember I said a little while ago that we needed some control over selectivity, or the ability to separate stations. If we were to connect the aerial right at the top of the coil—the end not connected to the earth lead—selectivity would be very bad, although the strength of stations would be greatest. For this reason, aerials are never connected to a set in this fashion—even in valve sets.

## AERIAL TAPPING

But if we connect the aerial to a point part way down the coil, selectivity begins to improve. The nearer we get to the bottom end of the coil the better it will be. The catch is that, as already mentioned, while selectivity improves, the volume decreases. The idea, therefore, is to select an aerial tapping which gives the best balance between these two. And that is the first reason why the coil we use has tappings on it. I will have more to say about this when discussing the set's operation.

The second reason for the taps concerns the connection of the crystal detector to the coil.

The crystal detector may be considered to have a very low electrical resistance. It is, generally speaking, a bad thing to connect a low resistance right across a tuning coil, as by doing so we reduce both selectivity and volume. In fact, if we happened to be designing a set where low selectivity circuits were needed, and sometimes they are, we would almost certainly obtain this effect by selecting a resistor of a low value, and connecting it right across the coil.

## CRYSTAL TAPPING

Yes, you have guessed it—to avoid this unwanted effect of the crystal, or at least to reduce its severity, we tap the crystal down the coil in much the same way as we did the aerial connection. We mustn't overdo it, however, otherwise we will once again find ourselves losing signal strength.

The correct position for this tap we will also discuss when telling you how to operate the set. The above simple explanations, however, will allow you to understand why we make the coil the way we do.

The tuning condenser is the next component to worry about. All you need to know here is what to ask for when you set about obtaining it. The condenser we used is of the type sold everywhere today for receivers of this kind, and is simply known as a "single gang tuning condenser." The electrical size of the condenser (which isn't always the same thing as its physical size) depends on the number of plates it has, and the size of each plate. In the old days we used to specify condensers by referring to the number of plates.

This isn't a good plan today, because some makers use big plates and fewer of them, while others use smaller plates, adding a few more to make up the right size.

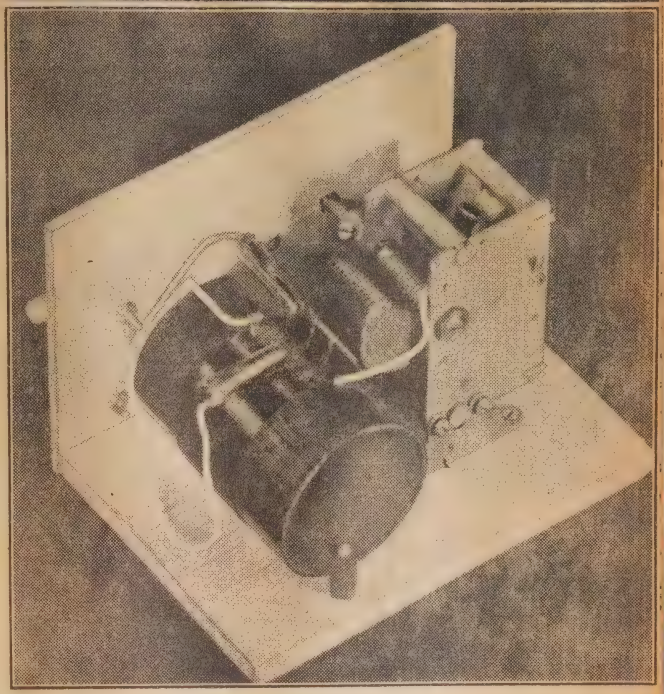
The modern condenser we used is therefore referred to by its capacity, which is about .0004 microfarads.

## TUNING CONDENSER

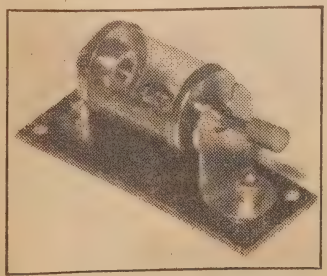
But it isn't necessary to use a modern condenser. An old-type condenser taken from even a very old set will do just as well, as long as its size is about the same. In round figures, a capacity of about .0005 microfarads is about right, small differences one way or the other not being important. What is important is that the moving plates do not touch the fixed plates, when the spindle is revolved, and that the insulating material used to support the fixed plates is not cracked or otherwise deteriorated.

Each type of condenser has its own mounting method. The modern types have feet fitted to them, which screw to the baseboard. Older types often have a "one-hole" mounting nut round the spindle. It is then only necessary to make a large enough hole in the panel and screw it into place.

## REAR VIEW OF CRYSTAL KING



This rear view shows how we mounted the tuning coil.



An alternative type of crystal detector which has a transparent barrel to keep dust away from the crystal.

## CRYSTAL DETECTOR

The crystal detector is made up of a metal cup which holds the crystal, and an adjustable arm which carries the catswhisker. The type we have shown is in two parts, which are mounted to the panel so that the whisker will conveniently reach the crystal. Another and somewhat better type includes a transparent barrel which keeps dust away from the crystal. Either type will do the job, and results will be the same.

The crystal you will probably buy in a little box. It is fixed in the cup either by a set screw, or by taking the cup apart, inserting the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crystal, and screwing together again, according to the type you use.

If your holder is not supplied with a whisker, you can easily make one from a piece of thin, springy wire. The idea is to have a sharp point for crystal contact, with enough spring to give you good control over the pressure of the whisker. (Incidentally, it has nothing to do with a cat, so don't get ideas about it!) To get a sharp point, it's a good plan to cut off the tip on the slant —you can do this with wire snips (or a pair of scissors when no one is looking!)

The coil is wound on a piece of former, which may be of cardboard or any other non-metal substance. Cardboard tubes used for posting rolled-up articles are quite all right. If you can give your former a coating of shellack, or even thin duco, it will help make the tube somewhat stiffer and easier to handle.

## WIRE SIZE

The wire isn't particularly critical as to size or type of covering. The usual wire obtained today is enamelled for insulation, although cotton or silk-covered wire will do just as well.

The size or gauge should be about 20, but anything between 18 and 26 will do quite well. Incidentally, 18-gauge is thicker than 26-gauge.

The wire is anchored at the ends by making two small holes about half an inch apart in the tube, and threading the wire in through one and out the other. Don't pull the wire too tightly, or you may tear the cardboard and have to start again in another place. It isn't hard to wind on the wire, keeping the turns neatly and closely together, just tight enough to prevent them slipping about and making a "loose" coil.

The easiest way to make the taps is to scrape the enamel or insulation from the wire for about one inch at the tapping point, and twist the wire several times fairly tightly to make a loop of bare wire. Don't overdo the twist, or you may break the wire. This wouldn't matter, as long as you join the break at the tap by making an extra firm twist. If you can solder, a stronger tap would be to twist the wires together for about half an inch, and then solder them together. This will make a firmer job, but it isn't essential.

## CARE WITH JOINS

Remember that any joins in the wire must not be made until the insulation has first been scraped off. It is bare metal-to-metal contact that is required. The idea of the insulation on the wire is to prevent turns next to each other from short-circuiting. This is why bare wire cannot be used for the coil unless each turn is spaced a little from the next—a pretty difficult job. So don't try it.

The two most useful coil diameters are 2½in. and 2in. A 2½in. coil will have 60 turns of wire, with tappings

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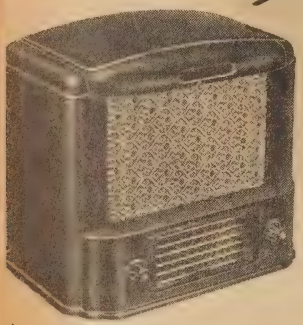

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at each 10 turns. The 2in. coil has 80 turns, also tapped at each 10 turns. If by any chance you have a 3in. former, the turns would be reduced to 48 turns, tapped each eight turns.

Neither the number of turns or the tapping positions are critical. A few turns either way will not make much difference, if any, to results.

The coil is mounted by a couple of bolts which go through the former at each end of the coil, and through the base. Actually you can screw washers will hold the coil clear of the base. Actually you could screw the coil right on the base if you like, or even tack it in place. Make sure, however, that the screws, bolts or tacks do not touch the windings at any point. It does not matter if the windings touch the baseboard, so long as it is a wooden one, and not made of metal.

## CONSTRUCTIONAL

The aerial and earth terminals may be mounted directly to the wood or masonite panel, which will be a good enough insulator just as it stands. Remember, by the way, that if you mount the terminals and the crystal holder direct to the panel, you cannot use a metal one. This would simply short-circuit all these points, and the set wouldn't work.

Don't smile at such an obvious warning, by the way. I remember actually getting a query from a reader some years ago in which he complained that his set wouldn't work. As a footnote, he mentioned that he had used an aluminium panel, and hadn't insulated the headphones terminals! Wouldn't it?

The only other component to mention is the bypass condenser across the headphone terminals. This isn't always needed, but theoretically it's a good thing to include, and may improve results in some cases. It's an ordinary mica or paper condenser of .001 microfarads. If there is a query about its voltage rating, it can be as low as 200 volts, as there is virtually no strain on it at all. This might help you when buying. Mica condensers aren't usually rated for voltage, and to tell the truth, any condenser of the .001 variety will suit.

## WIRING

Wiring up the set isn't a hard job. In fact, you could make the set entirely without soldering.

The exception might be in connecting to the variable condenser, unless it is an old type with screw terminals. Modern condensers do not have such terminals, so that you may have to solder at least one connection. This is quite easy with a small iron heated in a gas flame, if you haven't an electric soldering iron, and an inch of resin-cored solder.

Wiring up the set after all the parts have been mounted in place is a fairly easy job.

The coil is first of all connected to the variable condenser.

The lead from the top end of the coil is connected to the condenser fixed plates. This is the joint to be

**(Continued on Page 95)**

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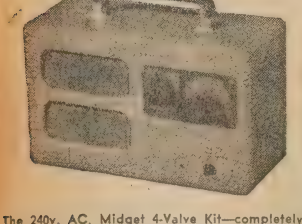

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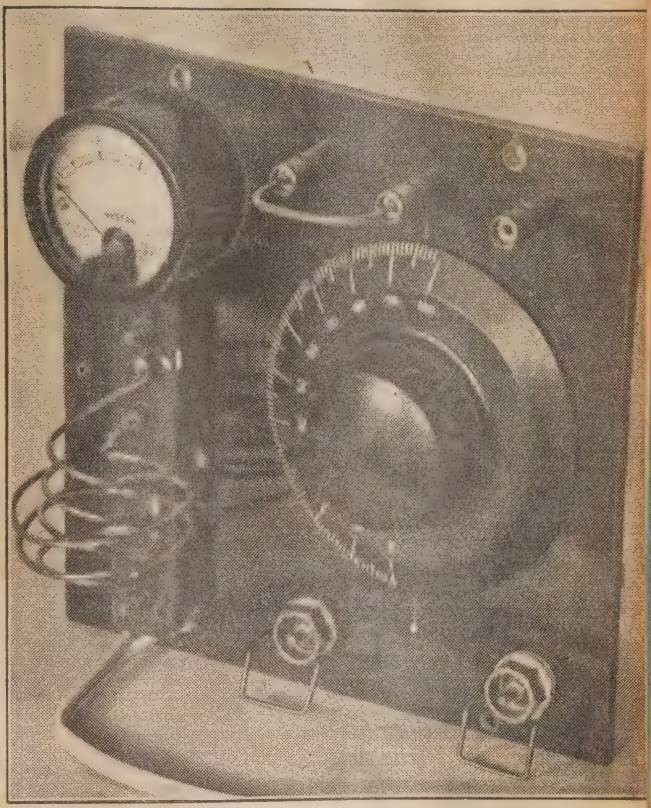
# MULTI-BAND AERIAL COUPLER UNIT

**In the Australian Short-wave Handbook we mentioned a simple 3-band antenna for amateur transmitters. This article describes a tuning unit which operates well with this antenna and allows it to be tuned to four bands; 3.5, 7, 14 and 28 Mc/s.**



The unit is compact and complete. Plug-in coils are used.

THE antenna in question is illustrated on page 115 of the handbook. It consists essentially of a 66ft. 6in. flat top, broken in the centre, and fed with open wire line 35ft. 9½in. long. It should be strung as high as possible to ensure low angle radiation on all bands. Solid or stranded wire can be used both for the flat top and the feeders, a spacing of from 2in. to 4in. for the feeders being usual.

On the 7Mc band, the antenna operates as a centre-fed half-wave radiator, the feeders being ¼-wave long. The low impedance at the centre of the antenna is thus transformed to a high impedance at the feed point, calling for a parallel tuned circuit as the source of energy. On this band the horizontal radiation pattern is the familiar figure "8," with maximum radiation broadside to the antenna.

## ON 14 MC.

On 14Mc the two sections of the antenna are resonant half-waves, voltage fed at the inner ends. The feed line is also an electrical half-wave long, so that the lower end is likewise a high impedance point, calling for a parallel-tuned circuit. The two half-waves are in phase, so that the figure "8" pattern is modified somewhat to give directivity and hence gain broadside to the antenna.

On the 28Mc band, the flat top consists of two full waves out of phase, producing a four lobe pattern, as for a single full wave, but with greater directivity and gain on each lobe. In addition, there will be numerous minor lobes. As the feed line is a full wave-length, a high impedance again appears at the transmitting end. Thus voltage feed is required on all three bands, 7, 14, and 28 Mc.

However, on 3.5Mc, the system can best be regarded as a 132ft. wire —one half-wave length—partly folded and fed in the centre; it thus requires current feed at this point, normally from a series tuned circuit. The change from parallel to series tuning is accomplished simply by altering terminal connections. The effective horizontal radiator is a wavelength long, and the horizontal field pattern a figure "8" compressed towards the wire.

Our tuning unit was built up on a piece of good quality bakelite, 7½in. x 7in., which happened to be available. The essential features of the unit are easy to follow.

The tuning condenser is actually an old .0005 mfd straight-line tuning job, which was double-spaced and fitted with ceramic insulators to ensure freedom from losses and breakdown troubles. Its final capacitance would be about 120 mmfd. This is mounted at the lower right-hand side of the panel, with a direct drive 0-100 tuning knob.

Above the tuning dial are three terminals, which connect to the feed

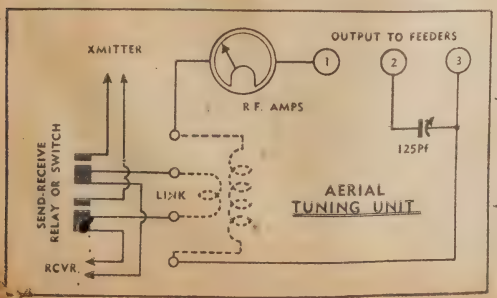
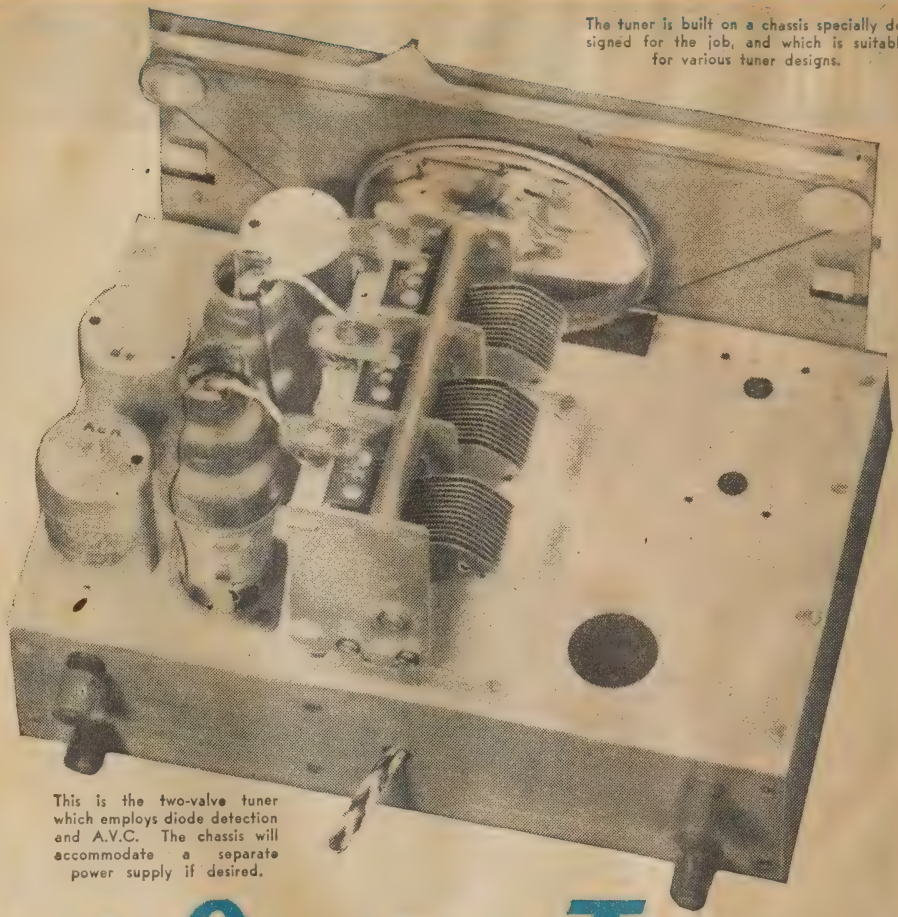



Diagram of the multi-band aerial tuning unit including a send-receive relay or switch.

(Continued on Page 83)



The tuner is built on a chassis specially designed for the job, and which is suitable for various tuner designs.

This is the two-valve tuner which employs diode detection and A.V.C. The chassis will accommodate a separate power supply if desired.

# High Quality Tuners

**With the long winter evenings in the offing it is appropriate that thoughts should turn to the design and construction of a high fidelity T.R.F. tuner. Here are alternative designs representing two distinct approaches to the subject, both well suited for connection ahead of any one of our standard amplifiers.**

by W. N. Williams

RIGHT at the outset comes the time-honored question, "Why TRF?" Although we have answered it on more than one occasion, a further brief explanation is warranted for those who may not have seen previous articles.

Broadly speaking, with our present system of amplitude modulation, it is impracticable to satisfy simultaneously the requirements of high fidelity and high selectivity. You can have them in any desired proportion, but not both together in a simple design. Receivers featuring variable selectivity have, up to the present, required components and facilities not available to the home constructor.

A superhet. tuner, as we know it, is an inherently selective device, capable of good station-to-station performance, but unable, by the same token, to pass side bands carrying the high modulation frequencies. On

the other hand, a TRF tuner is fundamentally less selective, and therefore becomes an obvious choice for the listener who desires only to receive a few local stations at their best.

Some enthusiasts use tuners with a single RF stage and a detector, but gain and selectivity is inadequate for anything but an ideal location. Our own choice, for general use, is a combination of two RF stages and detector, involving three coils and a three-gang condenser.

There is nothing special about the two RF stages, but the detector arrangement provides material for considerable discussion. One can afford to ignore all systems save the well-known diode and the "reflex" detector—to give it one of its half-dozen names. Under optimum conditions both detectors are capable of excellent quality and, if one sets out to do it, a good case can be made for either one.

Assuming that high quality is available from both systems, the choice of one or the other is governed largely by secondary considerations. On this occasion we are taking the easy way out by putting both sides of the question, giving alternative designs and leaving the choice to you.

The immediate advantage of a diode detector is its ability to provide an AVC voltage which levels out the variation in carrier strength from different stations, minimises blasting and obviates the need for a manual control in this section of the receiver. Admittedly, the degree of control is not as great as in a super-het. receiver, chiefly because of the limited gain.

If a diode-pentode valve like the 6G8-G is used, the tuner requires only two tubes, as against three for other types of detection. The diode tends to load the third tuned circuit, thereby reducing its selectivity and widening the pass band of a tuner as a whole. The use of AVC ensures adequate signal at the diode, and the chief remaining precaution in the interests of fidelity is to avoid heavy shunting of the diode load.

On the other hand, it is safe to say that the quality from a reflex detector will always be equal to that from a diode, and often better, if one considers distortion of a very small order. It does not prov AVC, but, on the other hand, thusiasts and home constructors n not be unduly deterred by the ne sity for adjusting a manual s control as well as the normal vol control on the amplifier. The amo of gain adjustment necessary vary widely with the location the receiver.

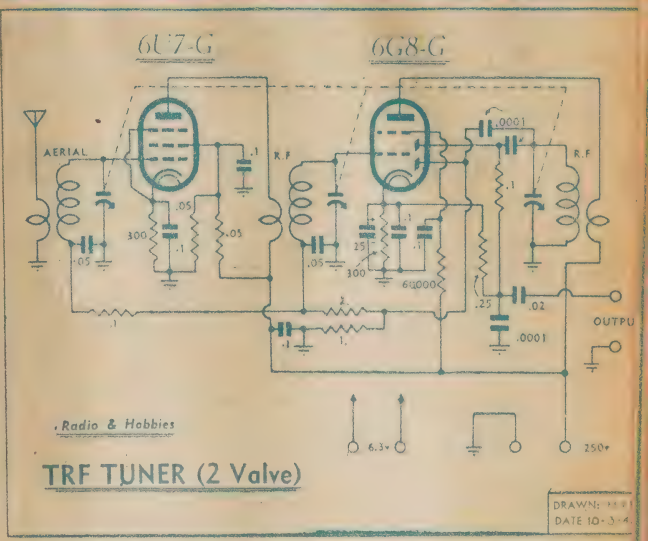
In the normal way, the gain w never be set at maximum, so stability requirements are less ur than that of an AVC contro tuner. Selectivity will be somew higher, but the pass band narro than the diode arrangement.

That, then, is the story, and choice must be governed by sideration of the factors mentio

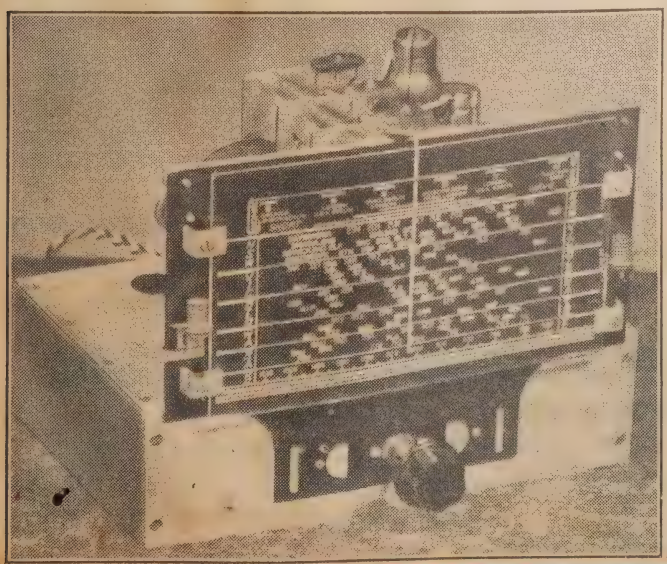
In November last we described "TRF Majestic" radiogram, elected to use diode detection AVC. The chief consideration hind this choice were the savin one valve and the elimination second gain control knob—a fa important point in the design single-unit receiver. Our first t is really nothing more than the f end of this receiver built on suitable chassis.

The problem of chasses is that seems always to be with Despite our desire and efforts to the number of chasses down minimum, new designs are inevit called for to keep pace with number of circuits developed

## CIRCUIT OF TWO-VALVE TUNER




This is the circuit of the diode-detector, A.V.C. tuner. Actual construction i very simple matter.



A front view of the diode-detector tu is included for reference. Both tun look much the same, except that t one has no volume control of its ow

# TRANSFORMER RANGE *by* FERGUSON

This list of FERGUSON TRANSFORMERS represents our standard range which we are at present supplying the Radio trade.

This is by no means our complete range when taking into account those Transformers being supplied to manufacturers' special requirements.

Transformers of this type cannot possibly be listed in the space available and manufacturers are requested to contact us direct regarding their special Transformer requirements.

# STANDARD RANGE TYPES

## OUTPUT TRANSFORMERS

| TYPE | PRIMARY | SECONDARY | RATING |
|---|---|---|---|
| 1 | 5000 and 2500 ohms S.E. | 12.5, 8.0 & 2.3 ohms Voice Coil | 10W |
| 1A | 5000 and 2500 ohms S.E. | 500 ohm Line | 10W |
| 2 | 5000 ohms P-P | 12.5, 8.0 & 2.3 ohms Voice Coil | 15W |
| 3 | 6600 ohms P-P | 12.5, 8.0 & 2.3 ohms Voice Coil | 15W |
| 4 | 10,000 ohms P-P | 12.5, 8.0 & 2.3 ohms Voice Coil | 15W |
| 5 | 5000, 6600, 10,000 ohms P-P | 12.5, 8.0 & 2.3 ohms Voice Coil | 15W |
| 6 | 5000 ohms P-P | 500, 250 and 125 ohms | 15W |
| 7 | 6600 ohms P-P | 500, 250 and 125 ohms | 15W |
| 8 | 10,000 ohms P-P | 500, 250 and 125 ohms | 15W |
| 9 | 5000, 6600, 10,000 ohms P-P | 500, 250 and 125 ohms | 15W |
| 10 | 5000 ohms P-P | 500, 250 and 125 ohms | 25W |
| 11 | 6600 ohms P-P | 500, 250 and 125 ohms | 25W |
| 12 | 10,000 ohms P-P | 500, 250 and 125 ohms | 25W |
| 13 | 5000, 6600, 10,000 ohms P-P | 500, 250 and 125 ohms | 25W |
| 14 | 5000 ohms P-P. | 500, 250 and 125 ohms | 32W |
| 15 | 6600 ohms P-P | 500, 250 and 125 ohms | 32W |
| 16 | 10,000 ohms P-P | 500, 250 and 125 ohms | 32W |
| 17 | 5000, 6600, 10,000 ohms P-P | 500, 250 and 125 ohms | 32W |

| TYPE | PRIMARY | SECONDARY | RATING |
|---|---|---|---|
| OP18 | 3800 ohms P-P | 500, 250 and 125 ohms | 60W |
| OP19A | 5000 ohms P-P (30-10,000 C/s) | 12.5, 8.0, 2.3 ohms Voice Coil | 15W |
| OP19B | 5000 ohms P-P (30-10,000 C/s) | 500, 250 and 125 ohms | 15W |
| OP20 | 11,600, 8400 ohms P-P (P.A. Range) | 500, 250, 166 & 125 ohms | 150W |
| OP21 | 8000 ohms P-P (30-15,000 C/s) | 500/125 ohms | 15W |
| OP22 | 3250 ohms S.E. 85 M.A. (30-15,000 C/s) | 2.3 or 500/125 ohms | 10W |
| OP23 | 3250 ohms S.E. 85 M.A. (30-15,000 C/s) | 12.5 or 8.4/2.1 ohms | 10W |
| OP25 | 10,000 ohms P-P (20-30,000 C/s) | Any Two Impedances in 4 to 1 ratio e.g. OP25 500/125. OP25 8.4/2.1 OP25 10/2.5 | 15W |
| OP8M | 10,000 ohms P-P | 500 ohm Line 10 Tappings | 15W |
| OP15M | 6600 ohms P-P | 500 ohm Line 10 Tappings | 15W |
| L1 | 500 ohms | 12.5, 8.0, 2.3 ohms | 10W |
| U1 | 30,000, 20,000, 14,000 10,000, 7000, 5000 2500 ohms P-P-R S.E. | 2.3 ohms Voice Coil Universal Speakers. | 10W |

## CLASS B DRIVER AND INTERSTAGE TRANSFORMERS

| | | Prim to ½ Sec. RATIO | | | |
|---|---|---|---|---|---|
| Single 6J7G Triode 5 M.A. D.C. Unbalance | Class A1, AB1, P-P Grids | 1 | IP3 | P.P. Class A, A1 Triodes 45's, 2A3's, etc. | Class B P.P. Grids 809, 830B, etc. | 2, 3 or 4 |
| Single 6V66 Triode 40 M.A. D.C. Unbalance | Class AB2 P.P. Grids 807, etc. | 2.5 | IP4 | S.E. or P.P. Triodes | Class B P.P. Grids 809, 830B, etc. | 2.8 or 2.15 |

## MODULATION TRANSFORMERS

| | | | | | |
|---|---|---|---|---|---|
| 6000 & 8000 ohms P-P | 10,000, 7000, 5000 ohms, 100 M.H. | 25W | M50M | Multi Primary | Multi Secondary | 50W |
| 3800, 6600, 8000 ohms P-P | 10,000, 7500, 6500, 5500, 4500, 3500 ohms 150 M.A. | 50W | M125M | Multi Primary | Multi Secondary | 125W |

## VIBRATOR TRANSFORMERS

| | | | | | |
|---|---|---|---|---|---|
| 150 | 6V at 0.9A D.C. | 150V at 25 M.A. | 6V/250 | 6V at 3.4A D.C. | 250V at 60 M.A. |
| 200 | 6V at 2.9A D.C. | 200V at 50 M.A. | 6V/240/U | 6V at 3.9A DC or 240V A.C. | 250V at 60 M.A. 6.3V at 2A (A.C.), using 6X5GT Non Sync. Operation. |

## POWER TRANSFORMERS

| | | |
|---|---|---|
| 240V A.C. | 150V/150V at 30 M.A. 6.3V at 2A. |

## FILTER CHOKES

| | |
|---|---|
| 25 | 30 Henries at 10V A.C. 100 C/s + 25 M.A. D.C. |
| 200 | 12 Henries at 10V A.C. 100 C/s + 200 M.A. D.C. |

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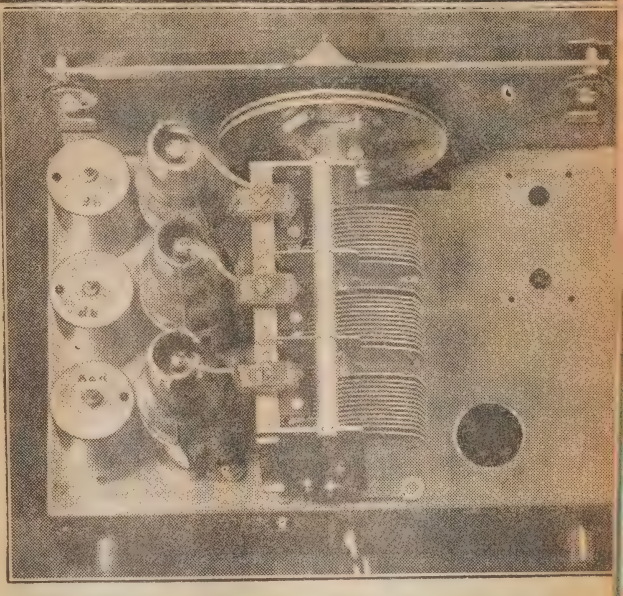
# A MORE SELECTIVE TUNER



This picture illustrates the difference in layout between the two tuners. An e valve is required in this version.

month in our laboratory. The chassis developed for these tuners will accommodate either one of the TRF designs and can also be adapted for a superhet. tuner to meet the requirements of readers wanting high station-to-station performance. Although both tuners derive their high tension and heater supply from the amplifier, there is room on the chassis to accommodate a rectifier, filter choke and a power transformer of the "Minivox" or "Little General" variety.

Our own chassis was hand-made from aluminium sheet, but, by the time you read this, a blueprint will have been prepared, so that manufacturers can release steel chasses to the trade.

The chassis measures approximately 10 x 6½ x 2¾ inches, and accommodates a medium-size straight-line tuning dial with flywheel. The gang condenser should be mounted with the spindle below centre, which brings the stator plates near the grid caps of the valves, mounted just to the right. The first RF amplifier stage is at the rear of the chassis, near the aerial and earth terminals, the second RF stage is centrally placed, and the detector coil towards the front. The audio output from the detector is fed across to a pair of terminals at the rear of the chassis, balancing the aerial and earth terminals at the other end.

## GRID LEADS

The leads from the stator plates to the "grid" lugs beneath the coils are about 3in long, but this cannot be avoided unless one goes to the trouble of using a special bracket and mounting the coils underneath the gang condenser. No trouble will be encountered, however, if the leads are kept well down against the chassis and separated as far as possible.

The rest of the wiring calls for no special comment, the parts falling more or less naturally into place. Keep the AVC and cathode bypass condensers near their respective sockets, and plan the mounting of resistors so that they will not flop around or short to other components. The wiring and coupling condensers on the diode circuit must be kept compact to avoid losses and hum pickup, the lead from the coupling condenser to the output terminals being shielded.

You may find that the tuner will tend to be unstable towards the low frequency end of the band, due mainly to resonance effects in the primary windings of the three coils. The effect is generally reduced by connection of the aerial and earth. An extra bypass condenser on the B+ line, screens or cathodes may eliminate it altogether.

## PLATE SHIELDING

If these measures fail, an almost certain cure is to shield one or both of the RF amplifier plate leads. Apart from the immediate value of the shielding, the added capacitance shifts the resonance of the primary winding sufficiently to offset the tendency to instability within the band. However, some loss does occur as a result at the high frequency end, and shielding should not be used any more than is strictly necessary. The same remarks apply, by the way, to the aerial lead-in wire and the RF plate circuit in superhets. incorporating an RF stage. If, perchance, you happen to use this circuit with old style solenoid coils, the low impedance primaries will not give this trouble, the gain tending to rise, instead, at the high frequency end of the band.

## POWER SUPPLY

The tuner will operate satisfactorily from any voltage between 200 and 300, and draw about 10 mA. under average signal conditions. Heater requirements are 6.3 v. at 0.6 amp., so that it should be quite feasible to obtain the supply from the associated amplifier. Four leads will be necessary, B+, B— or earth, and the two 6.3 v. heater leads. It is wise to avoid earthing the heater circuit in the tuner chassis, since a short circuit may occur if the heater wiring is already earthed in a different fashion in the amplifier.

The audio can be fed from tuner to amplifier through a short length of shielded cable and output terminals are provided for this purpose. One point warrants special mention just here. If the amplifier is of a type incorporating a bass boost system, hum may occasionally be encountered with the tuner conn and the bass control advanced frequent cause of this is conne of the shielded audio lead an B— lead to the amplifier chas two different points. It is possible under these circumst for eddy current effects to be municated to the audio input especially if the B— earth is where near the power transfo As a precaution, therefore, often wise to run the B— lead back to the same earth point as for the shielding of the grid lea

## THE SECOND TUNER

The second tuner utilises th flex detector, so called because vation of the output from the ca circuit produces a high degr negative feedback. The syst capable of very good fidelity a therefore much favored by q enthusiasts. Compared wit other circuit the chief differe in the use of three valves i of two and the necessary pro of a manual volume control.

The tuner is constructed o same experimental chassis as th valve version and, in fact, we s stripped one down after testi build up the other one.

The aerial coil and first RF fier are at the rear of the near the aerial and earth tern In front of that is the RF co the second amplifier, with the tor circuit behind the tuning

The arrangements of the co

# ACCURATE ALIGNMENT

OVER A WIDE RANGE

WITH THE

## CALSTAN

MODULATED OSCILLATOR

**Model 512 A.C.-operated Model 512 B. Battery-operated (with internal batteries and provision for external batteries).**

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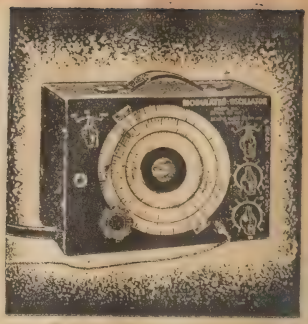

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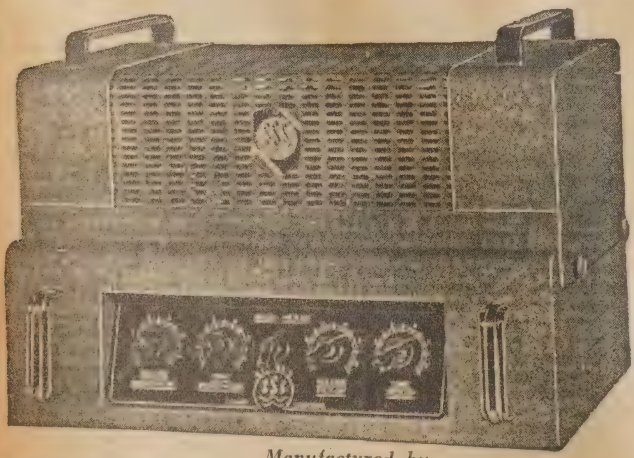
# AMPLIFIERS BY STEANE'S



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Replaceable panel buss-fuse for Power input.
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*Manufactured by*

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HEAD OFFICE: 60-80 MILLER STREET, MELBOURNE. FJ9149, FJ9140, FJ4543.
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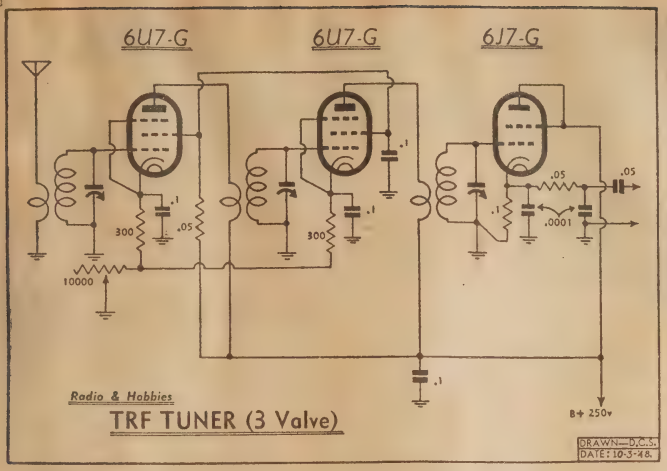



This tuner uses an extra valve which may be almost any triode, but has exceptionally good quality output. It has a manual volume control.

is something of a problem. Two knobs are required on the tuner, one for the dial and the other for gain control. One approach is to dismantle the dial and mount the spindle to one side of the chassis, with the gain control on the other side to balance.

Alternatively, the dial spindle can be kept central and the third position allotted to a radio-pickup switch, which involves bringing the pickup leads into the tuner chassis. Actually, the combinations of equipment and the cabinet arrangements may vary so widely that the physical arrangement of the controls is best left to individual constructors. There is necessarily much more latitude in the design of this type of equipment than there is for small single unit receivers.

## THE CIRCUIT

The electrical circuit is extremely simple and the underside of the chassis looks rather bare as a result. However, the performance is excellent. On local stations there is adequate selectivity and the gain never has to be advanced far enough to produce an unstable condition. On weak signals, with the gain well advanced, some tendency to instability may be evident, but the resultant sharpening up of the selectivity curve under these conditions can be a useful feature.

If the completed tuner goes into active oscillation with the gain control at maximum, the same steps can be taken as for the two-valve tuner. Check the placement of the grid and plate leads, try an earth and a longer aerial, and also additional bypasses on the screens and cathodes of the first two valves. The ultimate and rather drastic treatment is, once again, the shielding of the aerial lead-in wire and the plate leads of the two RF amplifier valves.

Power supply requirements are much the same as for the two-valve tuner and the same remarks apply with regard to connection to the main amplifier.

Irrespective of the coils used, trimmers are necessary for alignment purposes across each section of the tuning gang. They can be connected across the coils underneath the chassis, but they are more accessible if soldered above the gang condenser itself.

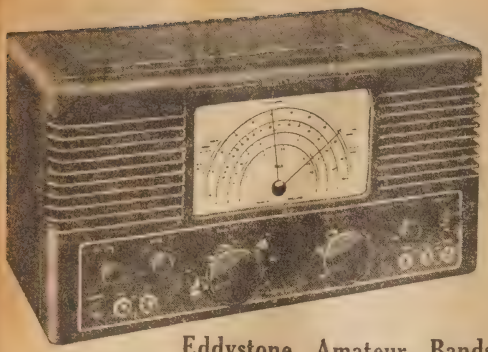
## ALIGNMENT

The alignment procedure with a TRF tuner differs considerably from a superhet. Lock the dial spindle so that the pointer overlaps the extremes of the scale equally at both ends. Then tune in a station towards the high frequency end of the band and note its position. If it is displaced from the calibration on the dial tune to one side of the signal in the direction of the calibration. Adjust the trimmers for maximum output and repeat the procedure until the station is worked along to the correct position. If you find that the trimmers have to be screwed hard in or right out, the position can be alleviated by loosening the dial locking screw and making suitable adjustment. As a check on trimmer setting tune to one side of the carrier and peak the trimmers on background noise—if it is high enough.

## COIL TRACKING

If the coils have variable iron cores they can be peaked for maximum response on a low frequency station, after which the trimmers should be re-checked at the high frequency end of the band. Screwing all the cores in will move the low frequency stations to the centre of the band, and vice versa. However, it should not be necessary to make wholesale alterations to the setting of the cores.

Provided the dial is calibrated for the particular type of gang condenser employed it will track without difficulty.



# This is it! the "640"

## ACCLAIMED EVERYWHERE AS THE FINEST "HAM" SET YET DESIGNED

**Eddystone Amateur Bands Communications Receiver Model 640**

### *MAIN TECHNICAL FEATURES*

1. Receiver has been designed primarily for Amateur Communication purposes, tuning range from 31 Mc/s to 1.7 Mc/s.
2. Designed to operate from Standard AC Mains with Inputs of 110 volts, 200/240 volts, 40/60 cycles, as well as from a 6 volt battery by the use of a separate vibrator unit.
3. Inclusive all valves, the "640" is a 9-valve job with one tuned RF stage, FC, two IF stages, detector-AVC-1st audio, 2nd audio output, noise limiter, BFO and rectifier. The valves used, in that order are EF39, 6K8, EF39, EF39, 6Q7, 6V6, EB34 EF39 and 6X5. These are all international octal based on the Mullard or Brimar versions and are therefore easily replaceable.
4. INPUT IMPEDANCE—400 ohms.
5. TUNING RANGE—
   (1) 31 to 12.5 Mc/s.
   (2) 12.5 to 5 Mc/s.
   (3) 5 to 1.7 Mc/s.
6. TUNING. An electrical band-spread arrangement is used for this purpose. Fly-wheel control is utilised on the band-spread condenser drive. The scale is clearly marked with all amateur bands, and is so arranged to enable accurate re-setting to a spot frequency.
7. I.F. FREQUENCY—1600 Kc/s.
8. CRYSTAL FILTER is vacuum mounted to provide a high degree of stability. Phasing control and "in/out" switch are brought out to the front panel.
9. Sensitivity is better than 2 microvolts input, for 50 milliwatts output, at all frequencies.
10. OUTPUT. Audio frequency output exceeds 3.5 watts.
11. "S" METER. A socket is provided for an external "S" Meter.

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# — EXCELAIR RADIO —

'PHONE: LA1604. 136 VICTORIA RD., MARRICKVILLE, N.S.W.

# FROM THE SERVICEMAN WHO TELLS

**My main impression of the past month is that it has been characterised by a series of small items, with no particular highlight to give substance to this opening paragraph. But, after all, these small things are the Serviceman's "bread and butter," so that mention of some of them may not be amiss.**

REMEMBER a couple of months ago I mentioned a built-in radio receiver. As far as the owner is concerned, the scheme has proved very satisfactory and his reaction is that he has no desire ever to possess a radio console again. He happens to be particularly keen on organ music and the smooth bass response of the installation is exactly to his liking.

However, during the past month the set has been rather erratic in performance, the volume being subject to some variation and an occasional plopping noise being evident. Then, a couple of days ago, the volume dropped off altogether, signals being barely audible, with the gain control turned right up.

## SCREEN RESISTOR

The receiver has a 6J7-G pentode audio amplifier, and I remembered a recent experience with a faulty screen resistor. So, after running the multimeter leads over the output valve socket, I checked the screen voltage. Not a flicker of the pointer rewarded my efforts. As I expected, there was no screen voltage.

So I set the meter to the 1000 volt scale and connected it between the screen pin and B-plus. The volume immediately came up to normal, showing that the resistor rather than the bypass condenser was at fault. Actually, the meter circuits were supplying a 1.0 megohm feed resistor between B-plus and screen. Easier than fishing for a resistor among the spare parts!

Having proved the point, the resistor was duly removed and replaced with a new 1.5 megohm unit. Why these resistors should go completely open so frequently, I can't imagine, but they certainly do.

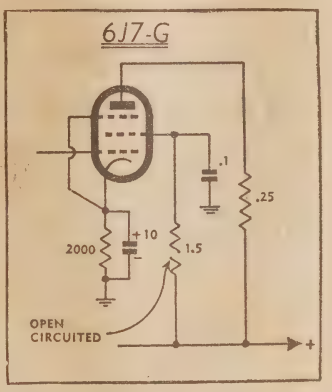
## VOLTS OR VOLTS?

"You can't read that there 'ere . . ." would appear to be the appropriate introduction to this second episode. Actually, it was in the nature of a complaint referred to me by an acquaintance, but it raises an interesting point.

This chap, together with a couple of his pals, are keen amateur movie enthusiasts, and their latest interest is a 16mm. home talkie outfit. Of the mechanical details, I have little knowledge, but I was asked to recommend a brand of resistors which have some resemblance to their coded value. The party explained that he could not measure anything like the 90 volts which was supposed to be on the PE cell, no matter how he adjusted the voltage divider.

Presuming that he was following the usual kind of phototube circuit, there would have been a load resistor of 1 to 2 megohms for the cell. The internal resistance of an ordinary multimeter is sure to be considerably less than this—actually 1000 times the voltage range, expressed in ohms—so that the insertion of the meter would totally upset the balance of the circuit.

On the 250 volt range, the meter




Showing the open circuited screen resistor.

circuit resistance would be 0.25 megohm. This would constitute a voltage divider system in which one-fifth of the supply voltage—assuming a 1.0 megohm load—would be effective across the meter circuit. In other words, even allowing for no additional drain at all through the load resistor, the voltmeter could never read more than a fifth of the supply voltage.

## METER RESISTANCE

Our friend mentioned a figure of 10 volts, so that he was evidently using a 1000 ohms-per-volt meter on the 100-volt scale, giving an internal meter resistance of 0.1 megohm. This, in series with a 1.0 megohm load, would have read one-eleventh of the supply voltage, which was evidently about 100 volts.

Immediately the meter was withdrawn from circuit, the voltage applied to the phototube would have reverted to something very close to 100 volts.

The general rule to be observed is that a voltmeter will only give a substantially accurate reading of circuit conditions when the internal resistance of the meter is several times the resistance of the device across which the voltage is present. Thus you can read the voltage across a battery with almost any voltmeter because the internal resistance of a good battery is comparatively low.

But you can't read accurately the screen or plate voltage of a resistance coupled amplifier stage, or the AVC voltage in a set, because the internal resistance of the meter is likely to be lower than the resistance supplying the voltages to be measured.

## VALVE VOLTMETER

If the voltage must be ascertained it is necessary to use a suitable valve voltmeter. Alternatively, one can arrive at the voltage by the round about method of measuring the current flow through a resistor, calculating the voltage drop across it and then subtracting the voltage drop from the known supply potential. Thus, if the current through a 0.25 meg. plate resistor is 0.5 mA the voltage drop across it must be 125 volts. If the supply voltage is 300, the voltage effective at the plate would be 300, minus 125, equals 175 volts.

Heaven only knows how many times these things have been said in technical publications, but there still seem to be folk who fall into the trap. In the case of our friend there was nothing wrong with his resistors. The fault was in his method of measurement.

What was more serious in his case, was the possibility that he was applying more than 90 volts to the gas phototube.

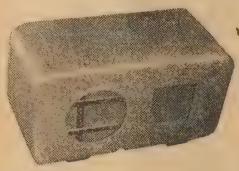
Most gas phototubes have a maximum voltage rating of this order, and it is quite critical. If the supply voltage rises, for any reason, much above the rated figure, even during a surge, the gas in the phototube is likely to ionise and the tube will be damaged. In the few talkie amplifiers I have had anything to do with I have been careful to apportion the resistors in the divider network in such a way that no more than about 85 volts could be applied to the cell. The sensitivity is not much reduced thereby, but the margin of safety is good to have.

## SHORTED ELECTRO

Another client's receiver had stopped abruptly. Rather, it failed to start playing one morning, and the owner had wisely switched it off and called me in.

Just as well, because when I switched the set on, there was quite a display of fireworks from the rectifier. There was a series of sparks down inside the plate and a spot of color appeared, indicating precisely clearly that the first electrolytic condenser had broken down. Chec

# GENUINE..
# RADIO BARGAINS
## "FOR THE RADIO ENTHUSIAST"



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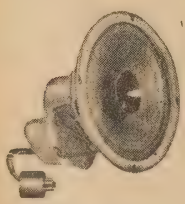

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Power Unit Type 32A, 12 volt Input, 1200 volt Output. 200 MA **£4/5/-**

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## Portable Radio

JOB LINE OF 5 VALVE PORTABLE RADIO, as illustrated. These are completely wired, but may need checking over. Can be supplied in variety of colors, and each set has 5in. Rola Speaker fitted.

Price less valves and batteries **£11/5/- We can supply valves and batteries if required.**

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**Brand New Line.**

**Primary Volts** .. .. .. 0-200-230-240
**Secondary Volts.** 400-0-400 at 150 M.A.
Choke Input. 125 M.A. Condenser Input.
2.5 Volt at 5 Amp.
5 Volt at 3 Amp.
6.3 Volt at 3 Amp.

Normal price of this Transformer is **£2/15/9.**

**OUR PRICE 37/6**

230 Volt to 110 Volt Step Down Transformers 100 V.A. Usual Price **£2/5/-**

**OUR PRICE 25/-.**

# MOTOR SPARES LTD.
**547 ELIZABETH ST. MELBOURNE.**

ing the chassis with an ohmmeter showed this to be the case.

Without further ado I unsoldered the faulty condenser, took a new 600-volt unit from the kit and put it in place. On checking the voltage I found that it was on the low side and rather unsteady into the bargain. After a few moments, my new condenser was warm and getting warmer. All the time, the voltage was dropping, indicating that the condenser was apparently on the way out—not just re-forming chemically.

So out it came and I tried the only other 600-volt condenser in my kit, this time with success. It is not a very comforting feeling to have a new component break down like this at well below its peak rating—yes I checked on this point. Unfortunately the quality of electrolytic condensers appears to be patchy. Most times they are OK, but, in common with other servicemen, I have more than once had evidence of a batch coming through apparently not quite up to the mark.

## SHORTING SOCKET

Another set I had to deal with this month gave forth a most impressive frying noise from somewhere around the back of the chassis each time it was switched on.

My first reaction in this case also was to blame an electrolytic condenser, but checking on these proved that they were quite in order. The noise was traced to an arc across the rectifier socket between the two layers of bakelite. There were three lessons to be drawn from this as far as I was concerned.

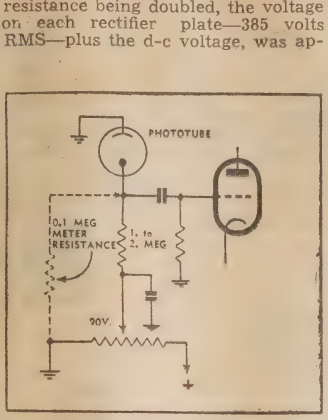
In the first place the socket was a wafer type of very compact design, which appealed to me as being more suitable for use in a battery set than in the rectifier position of a mains receiver. Even so, the socket would have been quite OK had it not been for a couple of other factors. In their wisdom valve manufacturers have seen fit to space out the pins of ordinary rectifier valves in such a way that there is a blank connection between each of the four used contacts, thereby doubling the insulation resistance of the socket and base.

In this case there was evidence that whoever had wired the receiver at the factory had used overmuch soldering flux and, although the surplus had been wiped from the surface, quite a lot had evidently flowed down between the two layers of bakelite.

I will agree that a good "dollop" of a potent flux makes soldering much easier and not even a layer of dirt or poor plating will stand up against it. But any good that comes from a smooth joint is far outweighed by the danger from the excess flux which runs down into the socket. In the "bad old days" I vividly remember one radio factory insisting on the use of their own specially treated resin for all soldering operations and instant dismissal awaited any unfortunate wirer who dared possess a tin of acid flux or used it to adulterate the resin.

Excess flux in and around a socket is likely to cause ultimate corrosion, noisy operation, or actual breakdown of the insulation, as in this case.

The third point of note was that pin 5 had been used as an anchor point for part of the filter circuit so that, instead of the insulation resistance being doubled, the voltage on each rectifier plate—385 volts RMS—plus the d-c voltage, was applied across a very small length of bakelite insulation, and that impregnated with flux.




Effect of meter resistance on tube voltages.

Hence the three morals: Use a good socket for the rectifier valve; avoid running flux down into the structure of the socket; don't use vacant pins adjacent to plates as anchor points for other sections of the wiring.

## ANOTHER TRANSFORMER

Still on the subject of shorts, I had another case of an internally shorting transformer, this time with a rather unpleasant variation.

You may remember that a couple of months ago I mentioned a transformer with an internal short between the high tension secondary and the electrostatic shield. This particular set exhibited much the same symptoms and, because the matter was fresh in mind, I recognised the fault almost immediatel Rather should I say, I was expectir the particular trouble before I ha handled the chassis very much.

When I did handle it, I had very distinct tingling sensatic somewhat akin to that from a cha sis which is bypassed to either sic of the power line. However, could see no evidence of such by pass condensers and surmised th there may be a leak between t chassis and the power mains. The certainly was, because in this s the shield had shorted not only the inner end of the high tensic secondary but to the outer end the 240 volt primary winding. Th net result could have been very u pleasant had I been standing on cement floor or had other conta with earth.

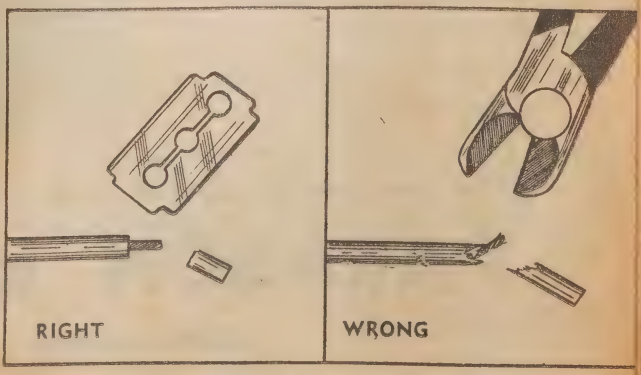
As a matter of interest the inst lation was prised open to reveal mass of verdigris where the copp or brass shield had once been. A parently a foreign agent was prese in the insulation used and this h gone to work on the unprotect surface of the shield.

## HOOKUP WIRE

It seems that short circuits a very much in the news, because y another one I came across involv the new plastic hook-up wire. Th is being used fairly widely no adays because of its cheapness a the fact that the prewar type is very short supply. Plastic hoo up wire is quite satisfactory provi ed certain precautions are taken its use.

The end of the wire should bared by running around the ins lation with a razor blade or sha knife baring from 1-8 to ¼ inch the wire. Work with a clean b hot iron and avoid heating the wi itself more than necessary.

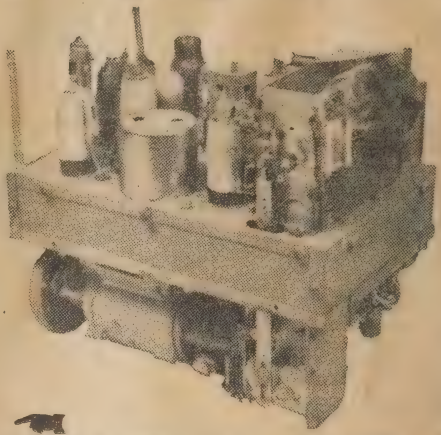
You will find that, if the wire bared by pulling at the end of t insulation with wire cutters, the i sulation will stretch and break wi a jagged end, tending to slide ba excessively when heat is applied the wire. Another point is th the softened insulation will tend flow into the insulation of adjace wires and possibly allow the me conductors almost to touch.




The right and wrong way to remove wire insulation.

# Surplus Radio Equipment

## I.F.F. SETS

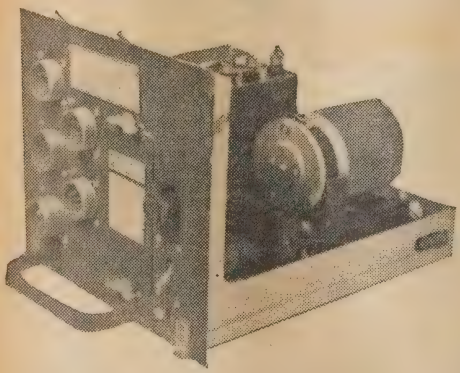


Complete with all valves including two CV6 high-frequency Triodes, a Genemotor with Blower and Gear Box attached, Relays, Condensers and a variety of other parts.

WEIGHT 40lbs., SIZE 12½" x 12½" x 9".

AT THIS RIDICULOUSLY LOW PRICE,

**70'- F.O.R.**



## CONTROL UNITS

New and complete. Contains a very useful Line Filter, Carbon Pile Regulator, Fuse Box, Lamp Holder, Switch and Condenser, etc. The chassis and case is excellent for small receivers.

WEIGHT 20lbs., SIZE 13" x 9" x 8".

A GIFT AT **15'- F.O.R.**

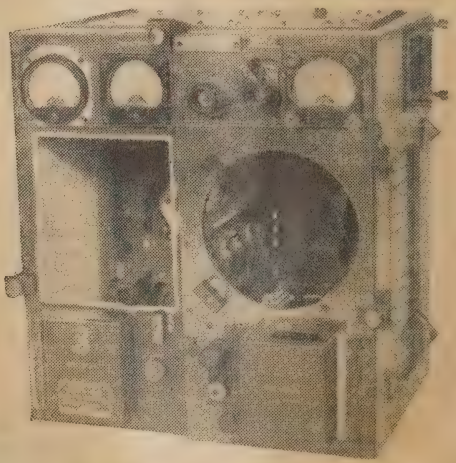
## R.A.F. TRANSMITTERS

Less valves and coils, contains a modulation Transformer suitable for grid modulation, neutralising Condenser, 1 .0-150 Milliamp Meter and 2 Thermo-Amp. Meters.

WEIGHT 40lbs., SIZE 13" x 12" x 9".

AT THE PRICE OF ONE METER

**37'6 F.O.R.**



***All the above may be purchased at No. 5 Royal Arcade, Sydney***

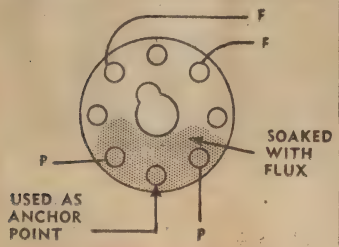
# PARAGON RADIO

245 PARRAMATTA ROAD,
HABERFIELD (SYDNEY),
N.S.W.

**PHONE: UA2145**

ADDRESS ALL MAIL TO:—
BOX 14, P.O. HABERFIELD,
N.S.W.

The case which brings this to mind involved the screen lead of an output valve which was running very close to one heater pin of the same tube. Apparently the screen wire had been installed first and was bearing up against the heater wire when the latter was soldered into place. The insulation had run together, allowing the conductors almost to short. Apparently a spot of extra vibration and movement had completed the work and the reason for my service call was simply a short circuit from the screen wire to the heater pin. A very simple matter to rectify, I agree, but it still cost the set owner a service fee.




The faulty socket referred to on the previous page.

I had an unusual case the other day. A quite modern set, which was given to strange noises and to variations in volume and background noise.

There was no sign of the trouble when I visited the house, so the set was brought back to the service shop for attention. It was switched on as a check while other work was proceeding. Sure enough, only a few minutes has passed when it began to exhibit the symptoms complained of.

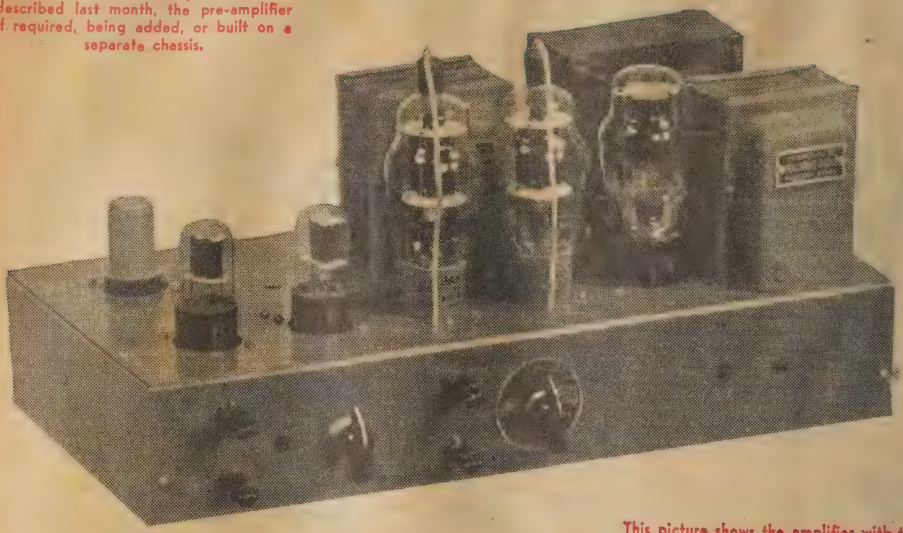
Mainly because I was busy on the other job, I merely switched the set across to the short-wave position, and tuned a station which happened to be on with a pleasant musical programme.

During the next half-hour, there was not the slightest suggestion of bother, so I tuned back to the broadcast band for a further check. Again same the noise.

Another tube? Still the trouble! Well, let's connect the aerial through a condenser to the converter grid. This time the set was apparently OK.

Must be the aerial coil. So, the multimeter was connected across the aerial coil primary, on the low resistance range. There it was! Just a quiver of the needle pointer, but enough to show that the winding was faulty. So a new aerial coil and one more satisfied customer.

The amplifier is essentially the same as described last month, the pre-amplifier if required, being added, or built on a separate chassis.



This picture shows the amplifier with the 6SJ7 pre-amplifier valve in place at the extreme left.

# Using the New Amplifier

**Having built your amplifier, the next consideration is its use with various input devices—pickups and tuners. The subject leads us into many paths. This article relates some practical experiments which to date have not been covered adequately elsewhere.**

VE have already had a good deal to say on the general subject, that a brief re-statement of the sition will suffice by way of troduction.

Continuous research by the record- companies has enabled them to ice on their master discs a much- proved sound track. The distor- n level is lower, frequency re- onse wider, there is greater dyna- c range and better "presence," due carefully-controlled studio tech- gue. Heard under ideal condi- ns, the best recordings are really od.

## CORD POINTS

However, difficulties occur in nsferring the groove pattern from master recording to commercial cs for sale to the public—to you fficulties arising from bulk hand- g of raw materials, mass produc- n and so on are still operating to dify the excellence of the original cording so the disc you ultimately buy may or may not be as impressive in regard to quality.

The average listener has generally not been aware of these developments because he is still using a pickup or radio receiver which cannot respond to the extended treble nor appreciate fully the difference in general quality. Some records may sound just a little more brilliant than others, may have better light and shade, but that is all. The possibilities of improved discs can only be appreciated by using better reproducing equipment.

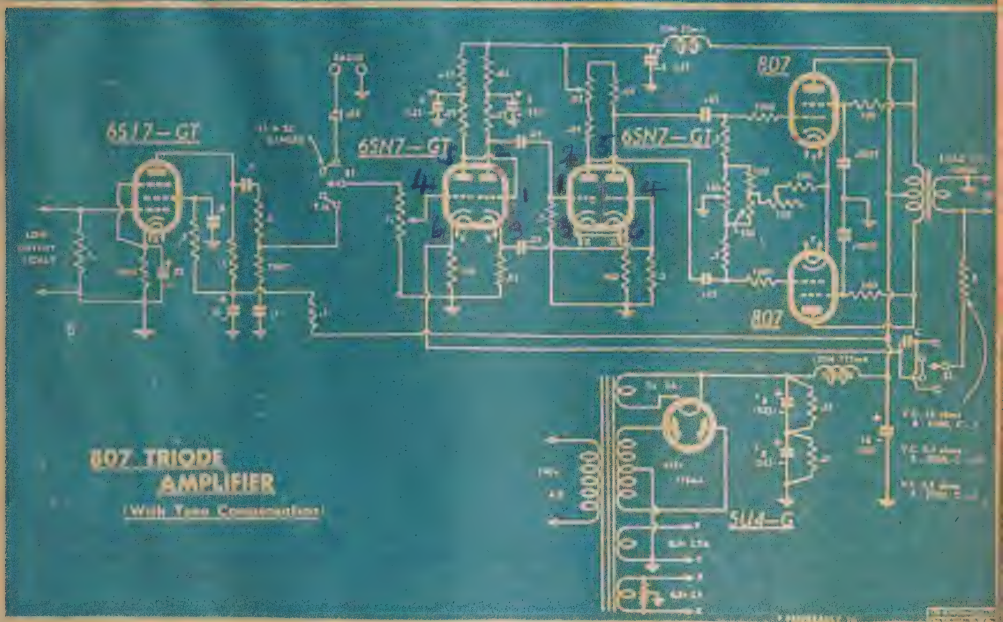
Accordingly, new pickups are appearing on the market especially designed to lift from the disc every vestige of signal impressed on it, and to do it with the minimum of wear on the groove. And when we have a complete combination of good disc, good pickup, good amplifier and speaker, reproduction reaches an entirely new standard.

Unfortunately, there is an aspect of the present transition stage which bewilders and disillusions many quality enthusiasts. New equipment is installed, probably at considerable cost, and they find that the added brilliance is spoiled by noises and distortion which the less ambitious equipment happily ignored. The reason is not hard to find, for ability to reproduce transients and treble also means ability to reproduce every imperfection of worn or imperfect discs. Some you will be able to enjoy no end. With others you will involuntarily reach for a tone control to reduce the treble to what it was before the new equipment was installed. Such is the price of progress.

## REQUIREMENTS

In terms of pickup design, improved transient response, wider frequency range, lower distortion and reduced record wear can all be interpreted broadly as a need for reduced mass and damping of the needle and moving parts. The high-fiedlity pickups accordingly make use of small steel needles or a semi-

# CIRCUIT OF AMPLIFIER WITH THE EXTRA STAGE




This circuit is suitable for all medium output pickups, new or old. For crystal pickups the pre-amplifier will not be required.

permanent jewel-tipped stylus. The actual principle of operation varies according to the ideas and policy of the manufacturer.

Some of the newer pickups represent a complete departure from established principles but, for the moment, these are of no more than academic interest to Australian enthusiasts. The high-fidelity pickups on the immediate horizon are mainly moving coil, moving iron and needle armature types. They have two important characteristics in common—low output voltage and absence of rising bass characteristic

## CRYSTAL TYPES

Crystal pickups, too, are being constantly improved and retain their advantage of high output and a naturally rising bass response. While they can thus be connected directly to more or less conventional equipment, it is doubtful whether they will ever equal the electro-magnetic types for absolute fidelity under optimum conditions.

In the light of this, certain broad statements can be made as a guide to readers who may wish to purchase a new pickup.

Conventional magnetic pickups are readily available in a variety of brands. They are cheap, rugged, have enough output for most purposes, and give just average quality of reproduction. Apart from minor refinements, they remain the same as ever.

Ordinary crystal pickups are rather more expensive, but have better all-round characteristics when used with standard amplifiers. They are lighter on records, but may be adversely affected in tropical or semi-tropical climates.

High-fidelity crystal pickups are capable of good results with conventional amplifiers, especially if provided with simple compensating networks as recommended by the manufacturers.

## ELECTRO-MAGNETICS

However, for actual fidelity, we have been impressed most by the new lightweight electro-magnetic types, of which we have tested several. As previously mentioned, all these have low output and are normally used with a matching transformer. The associated amplifier must have high overall gain and a bass response rising at the rate of approximately 6db. per octave below 250 c/s. In a few special cases the desired characteristic can be obtained by "doctoring" a conventional amplifier but, generally speaking, the requirements call for an additional stage to provide the gain and compensation.

This, in turn, calls for extra parts and necessitates care to avoid trouble with michophony, hum, and noise, as with a microphone pre-amplifier stage. There can be no compromise in the matter. If you are keen to try out one of the new pickups, you must adapt your amplifier to suit or the net result will be a weak, high-pitched sound seemingly far removed from the alleged high fidelity.

The 807 triode amplifier described last month has been used for many of our own tests, and has been adapted for the purpose both by modifying the feedback network and by the addition of two distinct types of preamplifier stage. The results of these tests will doubtless be a good guide to others who may use this equipment.

## INPUT VOLTS

With the feedback fully operative the amplifier requires an input for full output of about 1.5 volts, so that it is only suitable in this form for direct connection to a crystal pickup. Useful output would be obtained from some of the ordinary magnetic types, but it is not likely that many enthusiasts would go to the trouble and expense of building this particular amplifier and then hitch it to an inferior pickup.

With the feedback eliminated, the sensitivity is sufficient to give full output from an input of about 0.15

**WE are particularly keen to hear your reactions to these articles on amplifiers and pickups, particularly if you have built up this or similar equipment. Your experiences might help someone else to get good results. Drop us a line and let us know how you get on.**

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volt—a difference of about 10:1. There would be no point in using the amplifier this way, although its characteristics without feedback are still excellent, but the figures suggest the possibility of utilising the feedback for bass compensation.

This is accomplished very simply by inserting a selected condenser in series with the feedback loop, so that the feedback factor decreases below about 250 c/s. The optimum value of condenser depends on the impedance of the feedback circuit and the required boost, but our tests indicated that something very close to the normal 6db. per octave is achieved with a series condenser of from 0.2 to 0.25 mfd. This is for the 2.3-ohm voice coil and a 2000-ohm series resistor. For more moderate boost, a 0.5mfd. condenser would be used.

## FEEDBACK RESISTOR

With an 8-ohm voice coil, the feedback resistor is 3500 ohms, and the condenser values would work out at 0.15 and 0.3mfd. With a 15-ohm voice coil, the suggested resistor is 5000 ohms, making the condenser values 0.1 and 0.2 mfd. respectively.

Modifying the feedback in this circuit is not nearly as far-reaching in its effect as with the normal feedback amplifier. The output valves are used as triodes, and exhibit their characteristic tolerance of load variation as well as affording moderate electrical damping on the loudspeaker. Thus removal of the feedback at certain frequencies brings one back simply to normal triode output, which is a far different story from uncompensated pentodes and their high harmonic distortion.

With the suggested alteration, the amplifier retains its original characteristics for all frequencies over two or three hundred cycles, behaves as a normal triode amplifier in the lower register, but acquires a 6db.-per-octave boost just where it is required.

In this condition, we found that the amplifier worked quite well with the new English Connoisseur magnetic, operating through the step-up transformer provided by the manufacturers. Gain was not sufficient to fully load the amplifier, but it would make a satisfactory combination for home listening at moderate to high levels.

To obtain full amplifier output from low-output pickups, one can follow the obvious course of adding a simple triode preamplifier stage to boost the gain, relying on the "doctored" feedback circuit to correct the frequency response. Note that the series condenser would have to be shorted out substantially for radio programmes, where large bass boost is not required.

As an obvious alternative to the above suggestion, one can arrange the pre-amplifier constants so that it provides the necessary bass boost plus a margin of gain. This obviates the need for alterations to the main amplified and allows the feed-back to be fully operative at all frequencies.

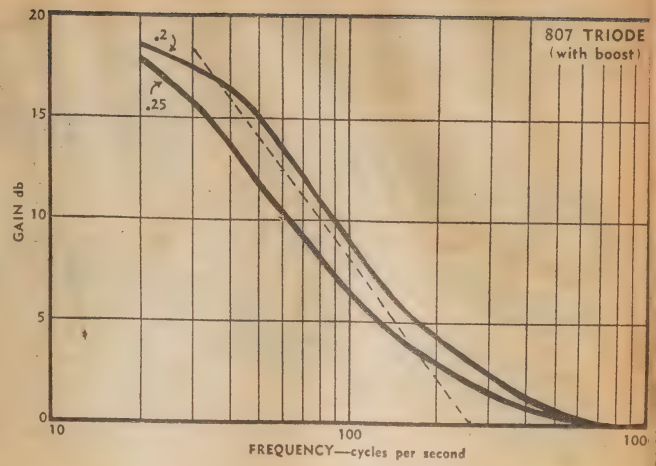
## BASS BOOST

This would be quite an important point in a conventional tetrode amplifier, where good bass characteristics depend to a large extent on the feedback. In other words, a clear case for the provision of an extra stage.

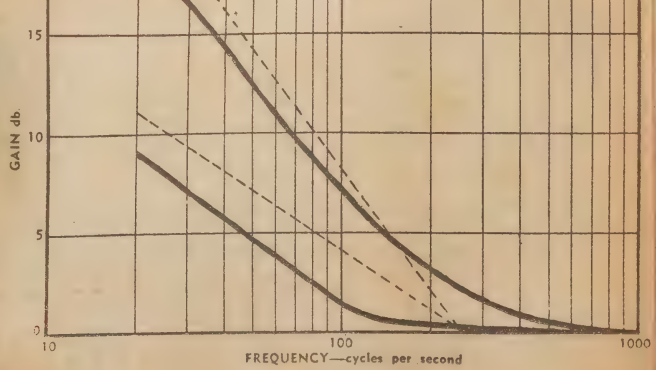
This extra stage has to provide compensation at the rate of 6db. per octave below 250 c/s, and, assumin the use of a simple r/c networ there will be a loss of from 15 t 30 times gain in the frequenc compensating circuit. Actually, th loss figure increases as the respons curve is made to approach the idea

It follows that, if the stage is giv ing something like its full gain a the lowest frequency, the gain in th middle register will be reduced t between one 15th or one 30th of th possible gain in the valve. Hence general purpose triode could be ex pected to afford the necessary com pensation, but have a gain of unit or even less than unity.

In the majority of cases some ad ditional gain is likely to be welcom so that alternative designs have bee evolved to meet individual require ments.




**Insertion of suitable condensers in the feedback loop of the 807 triode amplifier gives this almost ideal compensation characteristic. Condenser values are for the 2.3 ohm voice coil condition. See text for alternative values.**




You can expect these curves from the 6SJ7-GT stage. Constants giving the higher degree of boost will normally be used. The alternative constants and curve can be used if only moderate boost is required.

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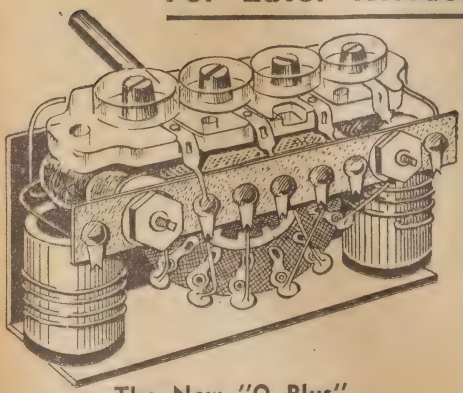

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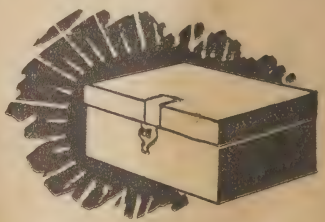

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First of these is a tone control and preamplifier stage, using a single pentode of the 6SJ7 variety. As indicated by the curves, the frequency response characteristic with a 0.1 mfd condenser is very close to the ideal in the maximum boost position. The 0.25 mfd condenser gives a boost approximating 3db. per octave, and the stage can be used for straight amplification by directly earthing the 7500 ohm resistor. Switching is indicated in the circuit for those who may require it.

## "MIDDLE" GAIN

At middle frequencies, the gain of the stage is approximately 2.5 times or 8db. Thus, it is an excellent choice to couple a conventional amplifier and a pickup like the Connoisseur magnetic.

In actual figures, a conventional type of gramo amplifier is usually designed to give full output with an input voltage of between 0.25 and 0.5 volts RMS—sufficient for direct use with any conventional magnetic or crystal pickup. The use of an additional stage with a gain of 2.5, reduces these figures to 0.1 and 0.2 volt. This, of course, is for full output; proportionately less input would be required to produce enough power for good listening volume.

The 807 triode amplifier is rather a special case. The degree of feedback suggested reduces the sensitivity to a point where approximately 1.5 volts is required for full output. Although it gives good volume with a Connoisseur pickup, as already mentioned, rather more gain is required for general use. The 6SJ7 stage would just about correct this position, but with nothing to spare.

Lack of space does not permit lengthy discussion of the installation of the preamplifier and tone compensating stage, but proven techniques should be followed. If the stage has to be installed on the main amplifier chassis keep it as far as possible from the power supply components and shield any lengthy grid or plate leads. Keep the grid and plate wiring and components down against the chassis to afford partial shielding.

All grid and cathode returns for the first valve must be made to one point only on the chassis, and that near the valve socket. This may involve insulating the normal earth terminal and slipping spaghetti tubing over the shielding braid to prevent earthing to chassis at more than one point.

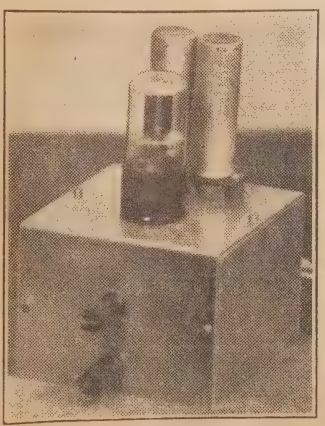
## HUM PROBLEM

Although the gain of the stage may ostensibly be only 2.5 times, it is necessary to remember that something approaching the full gain will be effective for frequencies below 100 c/s, so that problems of hum and instability are just as acute as with a normal high gain voltage amplifier stage.

The problem of filter hum and instability demands very heavy decoupling of the power supply, as indicated on the circuit. If motorboating troubles are encountered, it may be necessary to return the decoupling resistor direct to the filament of the rectifier valve and to increase the decoupling condenser to 16 mfd.

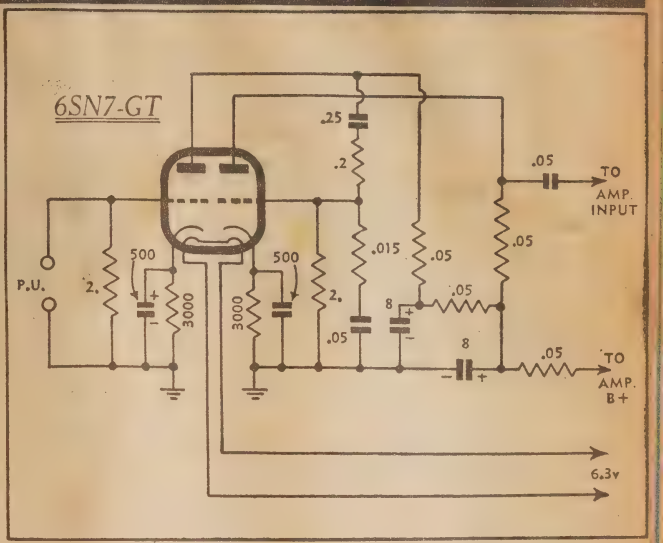
As far as the actual layout is concerned the arrangement adopted for our own amplifier appears to be the logical one. Two sets of terminals are provided on the front panel, a four position switch and a volume control.

The terminals at the end of the chassis are for connection to the pickup and the signal is fed straight to the grid of the preamplifier and tone control stage. This is wired to give a permanent bass boost of 6db per octave, but additional boost can be switched in from the feedback circuit if it is required.



A picture of our pre-amplifier built on its own small chassis.

## CIRCUIT OF 6SN7 PRE AMP.




The pre-amplifier shown below has this circuit, and is used with the low-output moving coil pickup.

## SWITCHING

With the switch in either P.U. position, the output from the preamplifier stage is connected to the volume control and thence to the amplifying circuits.

The radio position cuts out the preamplifier stage altogether and the output voltage from the tuner is fed straight to the volume control. There is good reason for this. The audio output from a tuner may amount to several volts, which would hopelessly overload the preamplifier stage, irrespective of the volume control setting. To avoid this overload would necessitate the use of a voltage dividing network so arranged that only a small portion of the tuner output was fed to the amplifier. There is the immediate difficulty of a ratio to suit general requirements, plus the fact that any residual hum and noise picked up by the connecting leads would be amplified along with the signal.

The last position of the switch leaves the input circuit connected to the tuner but brings in a small amount of bass boost for radio, derived, as previously explained, from the feedback network.

All this is more or less straightforward and should present no particular difficulties to any enthusiast who has had some experience of high gain amplifiers. The precautions outlined will be taken more or less automatically and the switching can be arranged to suit individual requirements.

But the position changes abruptly when attention is turned to some of the new pickups, where output voltage has been sacrificed to a much greater degree in the interests of other characteristics.

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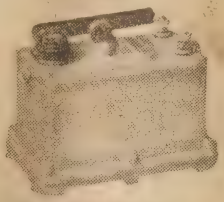

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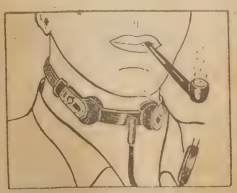

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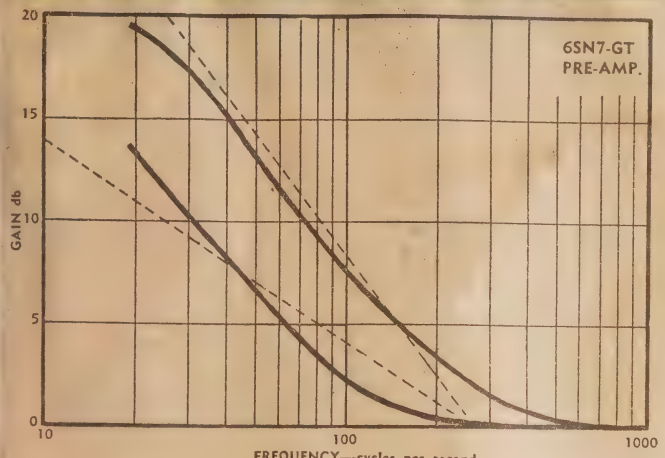
# CURVES FOR 6SN7 PRE AMP.




Two alternative response curves for the 6SN7-GT stage. The dotted lines represent a rise of 3db. and 6db. per octave below 250 c/s. Stage gain is approximately 15 as against 2.5 for the 6SJ7-GT, but problems of hum and stability are more acute.

Typical of the lower output pick-ups is the Lexington moving coil type, which has a very wide frequency range, operates with ½oz. weight on the needle point and delivers .05 volt peak to the secondary of its output transformer.

Since higher sensitivity is required, the simplest approach is probably a two-stage preamplifier and tone compensator using, for convenience, a 6SN7-GT twin valve. The circuit depicted is based on one suggested by the manufacturers of the Lexington pickup and the accompanying curve shows its response in association with the 807 triode amplifier.

## 6SN7 CURVES

The curves are actually very similar to that for the 6SJ7 stage, the alternative condenser values approximating 6db. and 3db. per octave compensation. Switching can be arranged to select either degree of boost, or no boost at all, but the 6db. per octave characteristic will be the one normally employed. This involves the use of a .05 mfd condenser in association with the 15,000 ohm resistor.

The extra gain is obtained at the expense of additional components, but there is unfortunately more to it than just that. With the boost in operation, the overall gain at low frequencies is extremely high being in excess of that normally encountered in modulators and public address amplifiers.

A simple calculation will emphasise the requirements. The pick-up may deliver a nominal 50 milli-volts at 1000 c/s. At 30 c/s the output will be approximately 5 milli-volts, which the amplifier is required to boost to full output—maybe 10, or 20 watts. For pleasant listening, the hum level must be virtually inaudible and, with such high gain, hum voltage injection into the first grid circuit must be reduced to a microscopic figure.

To achieve this result it is essential to isolate the 6SN7-GT pre-amplifier stage from the power supply, building one or the other on to a separate chassis. We elected to leave the basic amplifier intact and built up the preamplifier stage, with compensation, on a separate small chassis measuring 4in. x 4in. x 3in. deep. This accommodates the pickup output transformer and is connected to the main amplifier by leads a couple of feet long.

## MOTORBOATING

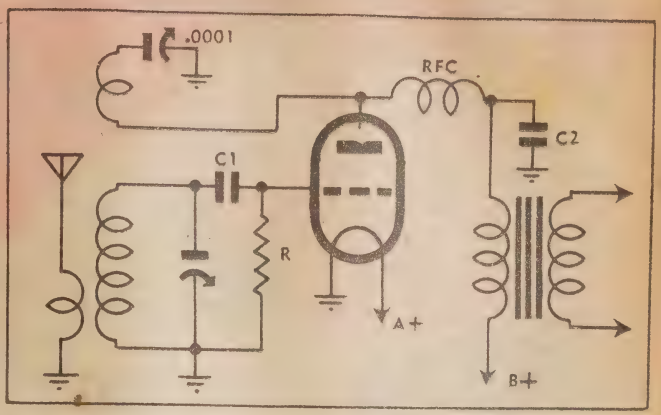
Two other points call for special attention. The very high gain at low frequencies is likely to cause instability in the form of motor-boating, due to coupling via the power supply.

The circuit shows very heavy decoupling but random time constant effects can still cause trouble. Some experiment may be necessary with the constants of the network and with the point in the main power supply from which the high tension supply is derived.

Last but not least, you can expect the preamplifier valve to be somewhat microphonic at full gain, even assuming that one can choose the best valve in a bunch. There is not much one can do about it but to mount the whole preamplifier on sponge rubber in a spot where it will receive the least vibration.

All this will sound discouraging to the quality enthusiast who may be keen to purchase one of the very low output high fidelity pickups. They are good—very good—but the design of the associated amplifier calls for an approach more akin to studio line equipment than the usual commercial amplifier.

# FOR THE JUNIOR EXPERIMENTER




A typical circuit using reaction which illustrates the various points in the article.

**The outstanding performance of small receivers can be attributed almost entirely to the use of reaction on the detector. The subject is far too large to cover in a single issue but we can at least make a start by taking the popular Reinartz circuit and examining the factors which make for smooth operation. Next month we can examine other types of reaction control.**

REACTION involves feeding some of the amplified RF energy from the plate circuit of the detector back into the grid circuit in such a way that it adds to the signal voltage already present. As the amount of energy fed back into the grid circuit is increased, so does the output from the detector rise, until the detector ultimately breaks into oscillation.

When this occurs, the detector, in association with the tuned circuit, begins to generate radio frequency waves irrespective of signals arriving at the grid. Its ability to detect those signals falls away sharply, and the net effect is that it beats with them to produce an annoying and continuous whistle. The whistle is audible in the phones or speaker, and it is also likely to radiate and cause interference in neighboring receivers tuned to the same station. In the "good old days" one of the regular jobs of radio inspectors was to deal with broadcast listeners who caused trouble by operating their receivers in this fashion.

## SENSITIVITY

Actually, the detector is most sensitive when operating just on the verge of oscillation and this condition can be satisfied only by critical adjustment of the reaction control. If it is not advanced far enough, tuning will be broad and sensitivity low; if turned up too far, the set will whistle on every station and produce little or no intelligible signal.

A basic requirement of the system is that the energy fed back must add to the signal in the grid circuit, not subtract from it. This is taken care of by making sure that the connections to the grid and reaction windings are correct. If a reaction control appears to have little or no effect on the signal strength, the first test is always to reverse the connections to the reaction coil and note whether results are thereby improved. If not, change back to the original connections and look further for the trouble.

## POPULAR CIRCUIT

Perhaps the most popular reaction circuit is as shown in figure 1. Part of the RF energy in the plate circuit is diverted through the reaction coil and condenser, the degree of feedback being controlled by the setting of the condenser. Too small a condenser will not give an adequate degree of control, while a large condenser is critical to adjust. The suggested value of .0001mfd. is conventional and satisfactory.

If, in practice, it is found that it is impossible to obtain quite enough reaction, say at the low frequency end of the band, and with the reaction condenser full in, a small capacitance in parallel will often overcome the difficulty. A variable trimmer is particularly handy, the capacitance being adjusted until the reaction condenser gives smooth control over the whole of the tuning range. More simply, it is often sufficient to connect a 25 or 50 mmfd. fixed mica condenser in parallel with the reaction condenser. Much the same effect can be obtained by adding a few turns to the reaction winding, although this presents difficulties with some commercial coils.

## PLATE VOLTAGE

Insufficient reaction can also be caused by operating the detector with too low a plate voltage. However, unless the detector plate circuit is resistance-coupled, it is unwise to apply more than about 45 volts to the detector plate circuit, as the current may become high enough to damage the valve or burn out the earphones or coupling transformer, as the case may be.

Still another cause of poor reaction is operation with low filament voltage or use of a faulty detector valve.

Last but not least, reaction will be adversely affected if the aerial is coupled too tightly to the tuned circuit. If coupling is by means of a primary winding, as shown, try reducing the number of turns on the primary winding, or moving it further away from the secondary. Inserting a mica condenser of between .0001 and .0005 mfd. in series with the aerial lead-in wire will have much the same effect. The smaller the condenser value, the less intimately will the aerial be coupled to the tuned circuit.

In the reverse order of things, the reaction in some sets can be very fierce, even to the point of being uncontrollable over part of the tuning range. From previous discussion, this would point to an excessive amount of RF energy being fed through the reaction coil.

One approach is to reduce the detector plate supply voltage, especially if it happens to be 45 volts or more. However, too drastic a reduction in plate voltage will reduce the ability of the detector to handle strong signals—an important point where it is feeding directly into a pair of headphones.

## BY-PASS

Another simple cure is to connect a small condenser directly between the plate of the detector and earth, thus providing an alternative path for the RF energy. The value of this condenser can only be arrived at experimentally for each receiver, because it is governed by the characteristics of the components in the detector circuit as well as by assembly and wiring methods. It is not likely to be larger than .0001 mfd. as a higher value would render the reaction circuit inoperative. Smaller values of fixed condensers are available, or you can try a variable trimmer between plate and earth.

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Now a few words about the RF choke. As the name implies, the RF choke is there to prevent radio frequency energy entering the output circuit, provided by the phones or audio transformer. More correctly, we should say that it offers a high impedance to the passage of radio frequency currents. If it were not for the choke, most of the RF energy in the plate circuit would return to earth through the audio wiring, perhaps leaving insufficient to operate the reaction circuit.

## RF CHOKE

The usual RF choke consists of many hundreds of turns of fine wire, usually honeycomb-wound on a small dowel or between small bakelite cheeks. Such a choke will generally operate well on the broadcast band, but may introduce difficulty on the short waves. The reason for this is simply that the capacitance across the numerous turns of wire may be sufficiently high to provide a path for the higher radio frequency currents so that, to all intents and purposes, the choke may just as well not be there. When building an all-wave receiver, it is generally wise to use a multi-section type choke, rather than the simpler and cheaper single section type.

But there is often a simpler way out of the difficulty—namely by replacing the choke with a resistor of up to about 10,000 ohms. A resistor will drop the plate voltage somewhat and absorb some of the audio power, but it is at least free from frequency characteristics, so try a resistor in the position and see what effects it has on performance.

The condenser C2 should always be included to bypass any small amount of RF energy which may pass through the choke. The capacitance must be high enough to bypass the RF energy efficiently without affecting the lower frequency audio currents which are present in the circuit. A value between about .0001 mfd. and .0005 mfd. is usual for this purpose.

Occasionally readers mention having built up a receiver and found that condenser C2 was unnecessary, the set operating just as well without it. It is not hard to understand why. If the choke is fully effective there will not be much RF energy left to bypass. Furthermore, there will inevitably be some capacitance from the audio wiring to chassis and also across the phones or audio transformer, and this can perform the same function as an actual condenser wired into the circuit.

## CAPACITY EFFECTS

But one cannot always rely on these random effects. If the choke is not the best—and this doesn't always depend on the brand—there may be considerable RF energy at the end remote from plate. Add to that low circuit capacitances and it is easy to see that a goodly RF voltage may be present across the transformer or earphones.

The result? Earphone cords may be "alive," so that movements of the head or body affect the reaction adjustment. The set may tend to squeal and howl when the reaction control is advanced. Both these effects and others can come from insufficient RF filtering in the detector output circuit.

## OPTIONAL

In some cases, a receiver will operate quite well without either the choke or the condenser. Once again, the designer has not erred in suggesting their inclusion. It is simply that the characteristics of the circuit and components have combined to permit normal operation. Another receiver built to the same circuit may behave in quite different fashion.

A lot of fun in building small receivers is in tinkering with them until the best possible results are obtained. But always do this with an open mind, realising that amendments and simplification found worthwhile in your own receiver will not always apply to others. Broadly speaking, it can be assumed that the designer has arranged matters to ensure good results from receivers using all kinds of odd parts.

Next month we will go on to discuss other reaction circuits and their characteristics, mentioning also the reason for the grid condensers C1 and the grid resistor "R."

# WHAT IS GOOD REPRODUCTION?

## MORE THAN FIGURES SAYS EXPERT

**This article has a particular interest because of our work with high quality sound systems, results of which appear in this issue. It stresses the psychological element which enters into all listening, and which explains why two similar amplifiers will often sound very different under different conditions.**

AT the Royal Society of Arts the B.S.R.A. met recently to discuss the essentials of good reproduction of sound, and heard a lucid and comprehensive exposition of the problems involved.

M. G. Scroggie, well-known engineer and journalist, who opened the discussion, said that there were two possible definitions of good reproduction—that which aroused in the listener the same sensations as the original sound, or that which aroused the most pleasurable sensations. Both involved the subjective opinion of a listener, and quantitative assessment was difficult; it was practically impossible to compare results obtained at different times and places.

Attempts had been made over the last 25 years to substitute objective measurements of reproducing equipment, but in spite of an enormous variety of tests from which to choose, no reliable system of objective testing had emerged. There seemed to be an unbridged gulf between the physical nature of sound waves and the emotional effect they produced. Hence it was necessary to be guided at all times by subjective effects and to continue to try to make objective tests agree with them.

### HASTY CONCLUSIONS

In correlating subjective and objective tests one should be on guard against hasty conclusions. Bad reproducers often created strong harmonics, but it did not follow that all reproducers that created strong harmonics would necessarily be bad.

On the question of perfect, or pleasing, reproduction, Mr. Scroggie referred to the frequent preference of listeners for a restricted frequency range, even when offered reproduction which was as perfect as present knowledge could make it.

Recent experiments by Dr. Olsen in America, dispensing with electrical reproduction and using direct listening with and without acoustic filter screens, showed that listeners had no inherent distaste for high frequencies. The conclusion to be drawn was that the ear was capable of detecting distortions too small to be measured by the instruments of the engineer. Possibly the high-order odd harmonics such as the 11th, 13th, &c. in small fractions of one per cent. may be the cause, but, in general, harmonics are relatively unimportant symptoms of non-linearity.

Harmonic distortion was easy to measure, but the single-tone input generally employed was singularly lacking in entertainment value and bore little relation to normal programmes. Non-linearity resulted in combination tones by intermodulation as well as harmonic distortions. Whereas the lower harmonics harmonise with the original tones, the intermodulation products do not. The ear itself is non-linear. How then does it distinguish externally produced harmonic and combination tones? Possibly because the non-linearity is of a different kind producing different tones. If so, one would expect it to be more tolerant of high—than of low—order tones.

### SPEAKER DISTORTION

Mr. Scroggie then dealt with distortions arising in the loudspeaker and referred to recent measurements of transients which persist after the signal has been cut off. He also mentioned the Doppler-effect modulation of high by low notes. Where amplitudes were large enough to make this serious, it was worthwhile using separate loudspeakers for high and low frequencies.

Modifications of the original sound pattern not usualy classed as distortions included differences in the size and position of the sound source, also the effect of reverberation at both ends of the reproducing chain. The apparent reverberation time could be increased by placing the main loudspeaker at a distance perhaps in an adjoining room, and using an extension loudspeaker with volume control near the listener, an echo effect could be produced by an almost inaudible output from the close-up source.

### REVERBERATION

In the discussion which followed, one speaker thought that the effect of room acoustics at the receiving end could be solved, given the necessary finance, by covering one wall with loudspeakers to simulate a full orchestra, switching to a single central unit for speech, and substituting an infinitely absorbing labyrinth for the opposite wall! Denman had approached this ideal many years ago when the audience virtually sat in the mouth of a large experimental horn loudspeaker let into the ceiling and, together with a thick carpet, themselves provided the requisite sound absorption.

Several speakers underlined the importance of reverberation, and all were agreed that it ranked higher than wide frequency response in its emotional effect on the listener. In assessing the merits of a loudspeaker the listener should not allow the effects of reverberation to cloud his judgment.

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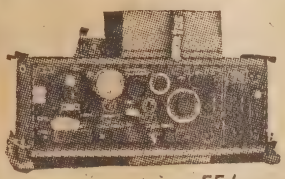

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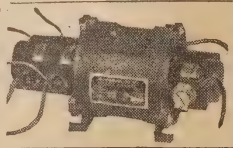

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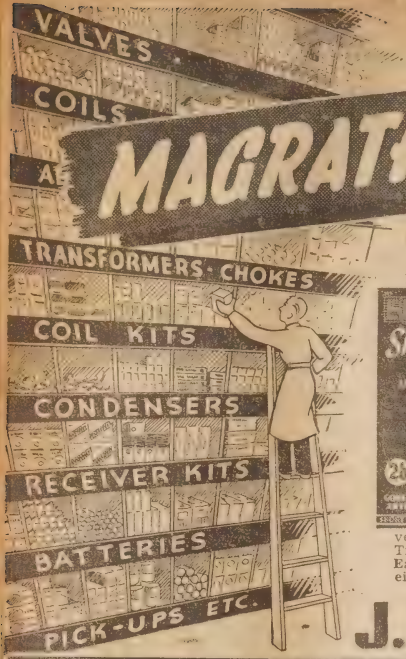


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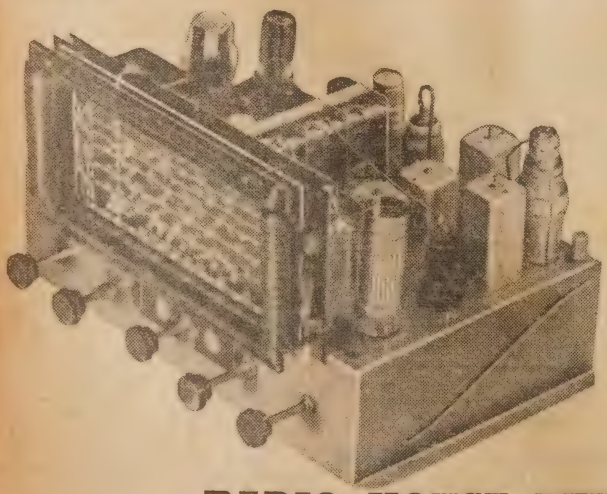

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# A READER BUILT IT!

**Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.**

## "LITTLE JIM" AS A SIGNAL TRACER

**"Little Jim" has never died and certainly does not look like fading away. This time the redoubtable little circuit has appeared as a combined portable receiver, short-wave set, signal tracer and radio tuner.**

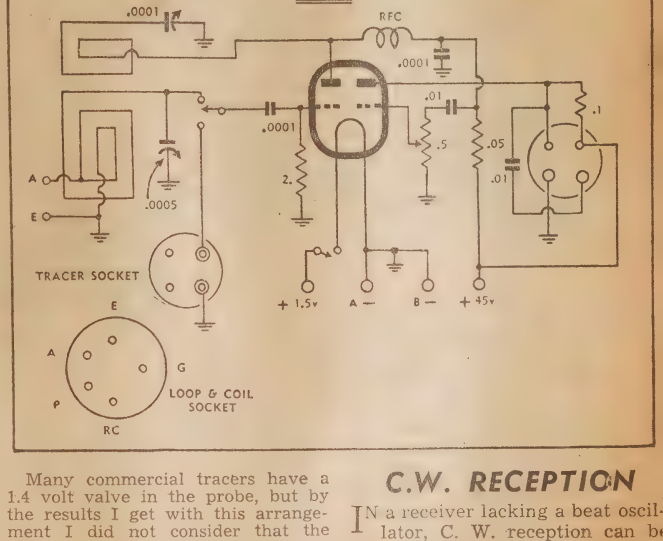
THE story of "Little Jim" in this multiple form comes from Mr. C. Gates, "Ubinia," Balladoran, NSW. Here it is:

It began as an A615 with a probe instead of tuner, became a headphone set with probe added, and ultimately arrived at "Little Jim's Mate," with loop aerial, A. and E. terminals, two-way switch from tuner to probe, and phones wired to a four-pin speaker plug. The socket for this plug is wired with a resistance-capacity unit, allowing the set to be used as a radio tuner.

The loop aerial is wired to a 5-pin plug, and I have short-wave coils wound to plug-in when using an external aerial and earth.

Probe, output and loop aerial sockets are wired as shown in the diagram, bottom view of sockets, of course. The phone cords are soldered to the small pins of their plug, and work with the .1 resistor permanently in parallel with them.

The probe I made from a tail-light adaptor, and about 15 inches of shielded lead. The lead goes to one large pin and the shield is earthed through the other large pin to chassis. I have not found it necessary to make any connection between tracer and the chassis under test, but, if necessary, a piece of wire wrapped around the shield could be earthed to the tested chassis.




Many commercial tracers have a 1.4 volt valve in the probe, but by the results I get with this arrangement I did not consider that the labor and expense would be justified. Try it and see. Besides, the one probe will act as tracer probe and tuner output lead.

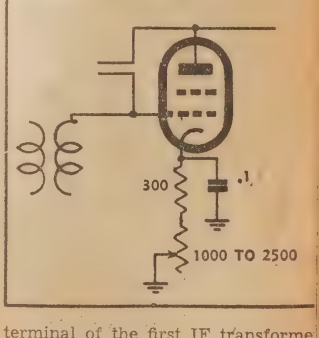
The tuning condenser may be any capacity at all from .0003 to .0005. Coils and loop can conform to any ordinary specification for small regenerative sets.

A 45-volt minimax and 1.5 round telephone cell sit in the back section of the case, and are held by a strip of metal with two brass nuts soldered over drilled holes.

## C.W. RECEPTION

IN a receiver lacking a beat oscillator, C. W. reception can be achieved by making the I.F amplifier oscillate.

Oscillation can be produced simply by soldering a short length of spaghetti-covered busbar to the grid




terminal of the first IF transformer below chassis, and another piece to the plate of the following tube. The two wires are brought within a half inch of one another and this usually gives enough grid-plate capacitance to produce oscillation. A potentiometer in the cathode circuit will control the oscillation. (From J. Holschier, 435 Wellington - street, Clifton Hall, Melbourne. VK3HM.

## MEASURING CAPACITANCE WITH A C.R.O.

CAPACITANCE values can be measured accurately and simply by anyone possessing a cathode ray oscillograph with conventional time base, and a variable frequency audio source.

Arrange two pin jacks on the panel of the instrument and connect to the coarse frequency switch in such a way that the unknown condenser can be switched into the time base circuit instead of the regular condensers.

Leaving the fine frequency control in an arbitrary but predetermined position, vary the frequency of the audio generator until a definite pattern of three or four waves appears on the screen. Then leave the audio generator set and switch to the regular time base condensers until a setting of coarse and fine frequency controls is found which gives the same pattern. From graphs prepared beforehand, the value of the unknown condenser can then be ascertained.

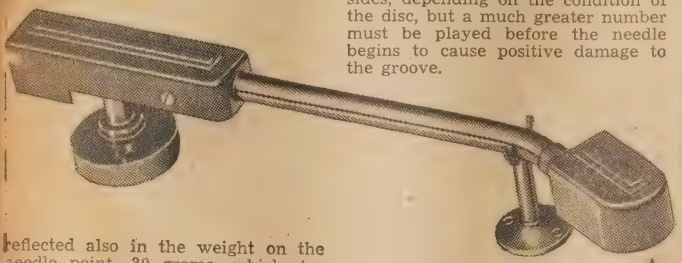
The drawing of the graphs in the first instance will call for a certain amount of time and a stock of known condenser values, but the effort is well worth while. (From G. E. Burder. 36 Macartney-avenue, Kew, Melbourne, E4.)

# TRADE REVIEWS AND RELEASES

## CONNOISSEUR MAGNETIC P.U.

**In the light of editorial matter elsewhere in this issue, the new Connoisseur magnetic pickup will be of special interest to readers. It is light in weight, has excellent fidelity characteristics and requires only moderate pre-amplification.**

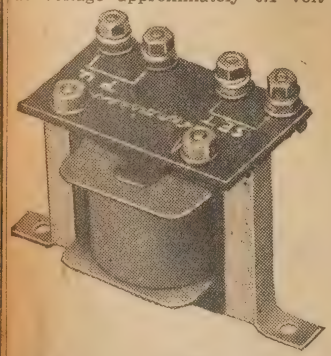
THE Connoisseur is basically a moving iron type, but the physical size of the head is only about half that of conventional magnetic pickups. This reduction in size is



reflected also in the weight on the needle point—30 grams—which, together with reduction in needle-point inertia, greatly reduces the wear on discs.

The pickup is intended for use with miniature "silent stylus" type needles and employs oil damping for the armature and a device to prevent the armature adhering to the pole faces.

The coil is of high impedance—300 ohms at 1000 c/s—and the output voltage approximately 0.1 volt



RMS under test conditions. This can be boosted to 0.5 volt by using the pickup in conjunction with a step-up transformer provided by the manufacturers.

Frequency response at 8500 c/s is down 5 db on the output at 1000 c/s. At 12,000 c/s the response is down 8 db. Below 1000 c/s the response is substantially level, so that base compensation is necessary in the amplifier to compensate for the recording characteristic.

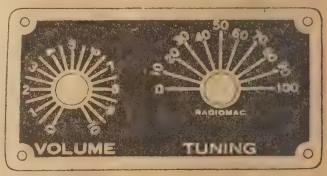
To facilitate changing of the needle, the head swivels through 180 degrees. It is held in place by a wedging action when the pickup is lowered on to the disc. Needles like the HMV silent stylus or the Columbia 99 are stated to last for 10 to 12 sides, depending on the condition of the disc, but a much greater number must be played before the needle begins to cause positive damage to the groove.

The pickup was tested in our own laboratory and gave very pleasing results.

Further details of the pickup and supplies are available from J. H. Magrath & Co., 208 Little Lonsdale-street, Melbourne, C1.

## MIDGET DIALS

MESSRS. R. W. STEANE & CO. have released a transfer for use with their flush-mounting control knob, reviewed in these columns some months ago. The transfer is attached to the front surface of the cabinet and forms a scale surrounding the tuning knob. Pattern and lettering are in red and gold. Sup-




plies are available through trade houses or from the manufacturers at 143 High-street, Kew, Melbourne, E4.

Also of interest to miniature set builders is the latest "Radiomac" nameplate, from Price's Radio, Angel-place, Sydney. The plate is illustrated above and the dimensions conform to specifications for the "Minivox" and "Handie-Talkie" receivers.

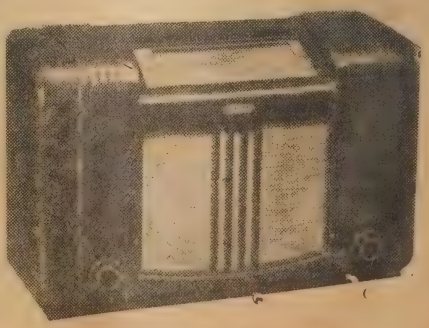
## NEW MULLARD AC-DC RECEIVER

MULLARD-AUSTRALIA Pty. Ltd. advise that they are now in production of an ac-dc receiver, model MUS. 1100. This new 5-valve table model features dual-wave reception, two I.F. amplifier stages, built-in power switch, floodlit dial, fully enclosed bakelite cabinet and an 8in. permagnetic loudspeaker.

The circuit embodies a high gain converter valve, Type UCH4, followed by two stages of I.F. amplification using UF9 valves, and then followed by a combined demodulator and output valve, Type UBL1. Rectification is by means of a half-wave rectifier, Type UY1.

Mains consumption of the rectifier has been reduced to approximately 40 watts, reduction being made possible in the new low consumption valve series used in which the heater current is only 100 milliamps.

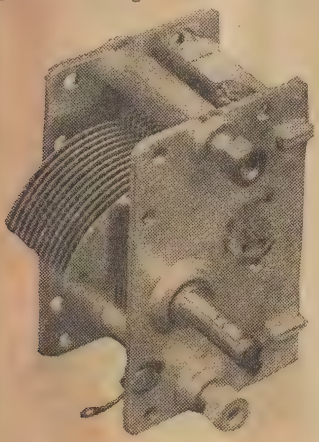
Retail price in all States is £36/17/6. Inquiries should be addressed to the nearest Mullard distributor or to Mullard-Australia Pty. Ltd., 35-43 Clarence-street, Sydney.



# NEW TUNING CONDENSERS

A VARIETY of high quality English tuning condensers are appearing on the local market from time to time.

Illustrated below is the Plessey single gang, which is ideally suited to the construction of all small sets, as well as modulated oscillators, &c. The condenser is small in size and has the stator plates mounted on ceramic pillars. Rotor plates operate on ball bearings and the shaft is

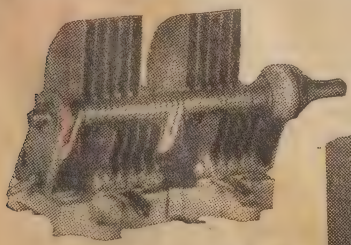


turned down to ¼in. diameter, allowing the condenser to be used with a conventional pointer knob. Capacitance is approximately .0004 mfd.

Supplies are available from Prices Radio, Angel-place, Sydney, and the price is 8/6.

★ ★ ★

United Radio Distributors, Phillip-street, Sydney, have stocks of Jackson transmitting condensers in the following types:



| | | |
|---|---|---|
| SI 6 | Split Stator | 5.5-25 Pf. |
| SI 10 | Split Stator | 5- 59 Pf. |
| SE 18 | Single Gang | 10-168 Pf. |
| SI 30 | Single Gang | 12-107 Pf. |
| SI 16 | Single Gang | 8- 58 Pf. |
| SI 10 | Single Gang | 6- 38 Pf. |

These condensers are rated to stand 1000 volts between plates. They utilise a low-loss ceramic base and have brass plates, soldered to supports and electroplated. They are suitable either for chassis mounting or one hole fixing.

# ADVANCE SIGNAL GENERATOR

**Of special interest to servicemen is the type E "Advance" Signal Generator. Available in this country for £37/5/- (plus tax), it gives continuous band coverage from 300 kc to 60 Mc.**

THIS coverage is provided by six separate bands and the harmonic content of the highest frequency band is such that signals are available to 120 Mc. A directly calibrated dial is provided, with vernier drive.


For tests requiring a high signal voltage, an output of 1.0 volts is available from a "Full R.F." socket, at an impedance of 50 ohms. Lower outputs are available through an attenuator network involving a continuously variable control and a range multiplier switch.

The output impedance is low at all settings, allowing the use of a standard dummy antenna for all tests, and this is provided with the instrument. The R.F. signal is available with or without modulation, the audio voltage being available for test purposes from a separate socket.

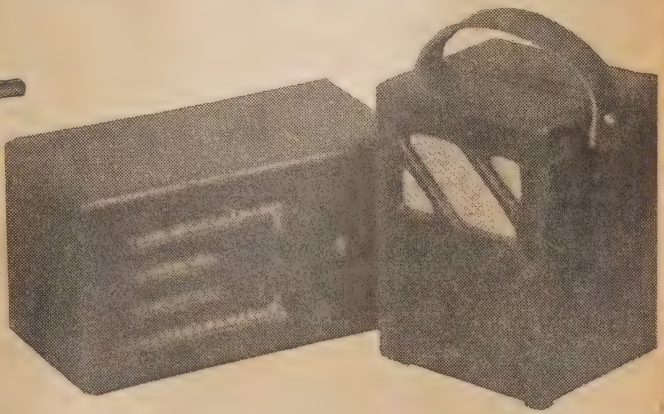
The instrument is finished in cream lacquer and operates from either 110 or 240 a-c mains. Three valves are employed, an EF50, 6J5-G and a 6X5-GT.

The EF50 is used as a negative transconductance oscillator, utilising the special characteristic between suppressor and screen. With this system it is unnecessary to tap the tuning coil, although links are switched into circuit to feed the attenuator system. A combination of plate and screen modulation is employed.

Full information on the circuit, together with all component values, is given in the instruction booklet, which comes with the generator. Such a booklet is particularly valuable for service reference with an imported instrument.

For further information, application may be made to Jacoby, Mitchell and Co. Pty. Ltd., 477-481 Kent-street, Sydney.

# CABINETS FOR R. & H. RECEIVERS



The two cabinets illustrated above are built to "Radio & Hobbies" specifications and intended for use with the "Minivox" and the "Handie-Talkie" receivers. They can be supplied in a variety of colors, leatherette covered, or leather covered to special order. Supplies are available through normal trade channels, but wholesale trade enquiries can be addressed direct to the manufacturers, Messrs. Gibbons and Denham, 122 Darling-st., Balmain.

RED LINE

# EQUIPMENT

for

# THE NEGATIVE FEEDBACK AMPLIFIER ★

## OUTPUT TRANSFORMER

Primary Impedance 10,000 Ohms 807 (T) P.P.

Secondary Impedance 15 Ohms * plus 34 db.

FREQUENCY RESPONSE: Linear within 0.2 db.
20 cps to 30,000 cps.

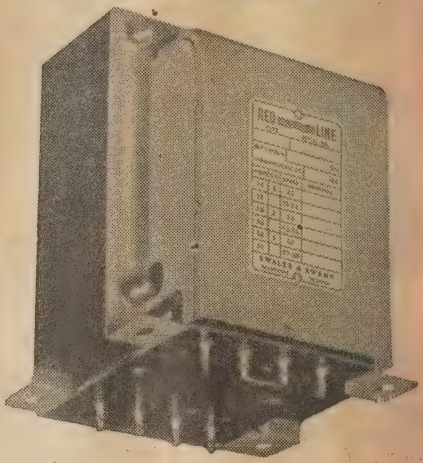
PRIMARY INDUCTANCE (at low ac flux) not less than
125 Henries.

LEAKAGE INDUCTANCE: 17 Millihenries.

INSERTION LOSS: 0.4 Decibels.

This transformer may be used to obtain a gain
reduction of up to 25 db across 4 Stages in a
suitable negative feedback circuit. ★

** to 500 Ohm Line if required. (AF10).*



TYPE No. AF15
Weight 7lbs. Price: £6

## POWER TRANSFORMER

210v, 210v, 230v, 250v, 50 cps. Sec. H.T. 500/500v at 175 ma.
5v 3a. 6.3 v.; 2a 6.3v. 3a Type 17503 £3/12/6

## FILTER CHOKE

12 Henries
175 mA .. Type 201515 £1/11/0

## SMOOTHING CHOKE

25 Henries
60 mA .. . Type 50825 £1/7/0

*A Choke Input Power Supply shown in Radiotronics 128 requires:*

Power Transformer
Type No. 25563 £4/10/4
Choke (1)
Type No. 102512 £1/16/1
Choke (2)
Type No. 201515 £1/11/-
Choke (3)
Type No. 50825 £1/7/-

★ *as described by Mr. D. T. N. Williamson in "Wireless World," April and May, 1947.*

# RED LINE EQUIPMENT PTY. LTD.

INCORPORATING SWALES & SWANN

**WORKSHOPS:**
Cen. 4773
2 Coates Lane, Melbourne.

**CITY OFFICE:**
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157 Elizabeth St., Melbourne.

A GUARANTEE OF DEPENDABILITY

# BOOK REVIEWS

**"A TEXTBOOK OF RADAR,"** published 1947 by Angus and Robertson, Sydney.

Written by the staff of the Radiophysics Laboratory, CSIR, this new work sets a high standard as an Australian textbook. The Radiophysics Laboratory was set up in 1939 as the centre of radar research and development for the Allied forces in the Pacific area. Since the war, its invaluable work has been carried on and the staff expanded to include some of the best-known names in the ranks of Australian radio engineers.

The individual chapters include contributions not only by members of the staff but from a larger group of specialists, so that the whole work is very comprehensive and thorough in its treatment of the subject.

The introduction is by Dr. E. G. Bowen, chief of the division, and the basic review of radar principles by Dr. J. L. Pawsey. Then follow chapters on the magnetron, power oscillators, modulators, aerial systems, receivers, display circuits, and so on. Special sections are devoted to ground, airborne and shipboard systems, and to radar navigation, all written by experts in each subject.

Passing reference is made to more moderate frequencies, but discussion is confined mainly to techniques which apply for centimetre wave equipment. Australian price for "A Textbook of Radar" is 50/-, postage extra.

★ ★ ★

**"THE ABC OF ELECTRONICS,"** by W. B. Watton, AMIEE, Assoc. AIEE.

As the author points out, the general subject of electronics has developed to such a scope that it is virtually impossible to cover it fully in the pages of a single volume. Nevertheless the author has endeavored to outline the basis of electronic development and then to tell something of its application to industry.

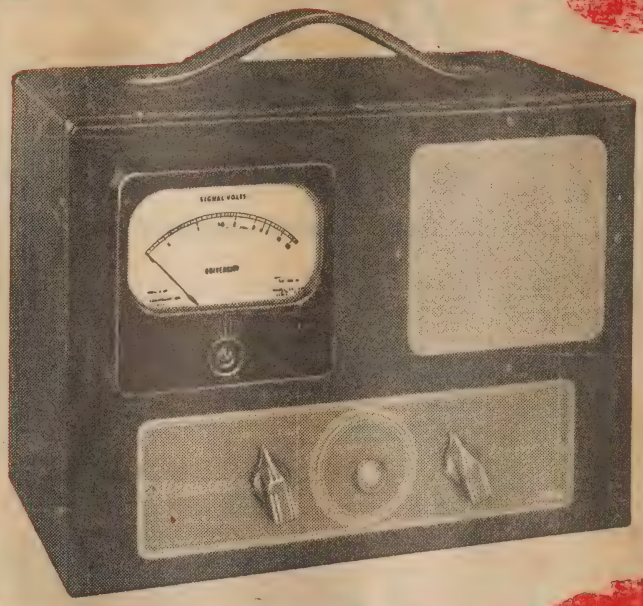
The first five chapters, therefore, deal with valves, special industrial type rectifiers, PE cells and the cathode-ray tube, with a discussion of their application in actual equipment.

Then follow sections dealing specifically with high frequency heating, communication—visual and otherwise—and a variety of miscellaneous devices which are now the tools of science and industry.

The book is simply written, well illustrated, and therefore suited to the requirements of electricians, mechanics and others who may wish to gain some insight into the newer techniques.

You Waited for It! HERE IT IS!

The New **Signal Tracer!**




Another "FIRST" from **University**

## WHAT IT IS . . .

It's a Signal Tracer—the most versatile and fool proof instrument that has ever been designed for speedy and economical radio service work and general fault finding. It is built into an attractive brocaded steel case with a leather carrying handle and all necessary test leads and instructions are supplied. It embodies one of the famous "University" four inch square meters together with a new 3½" permagnetic speaker. Standard type easily replaceable batteries are built internally and a book of instructions explains the uses and shows how signal tracing is the latest up-to-date method of service work. You hear the signal in the speaker—and you see the signal on the meter.

## WHAT IT DOES . . .

The spearhead of this most efficient instrument is the probe. This is a bakelite moulding into which is built one of the new, spearhead bantam type valves. It actually traces the path of the signal RIGHT THROUGH the radio receiver from START TO FINISH. It can be used just as effectively on amplifiers or intercommunication systems and will give the same effortless and speedy service. When the probe strikes the faulty section, indications are given by the meter and speaker both. It will indicate clearly and easily faults in coils, condensers, intermediate frequency transformers, components as the signal is traced. This is the instrument you MUST have—a necessity in every place where radio work is being done. Ask for Model U.T.B. "University" Signal Tracer.

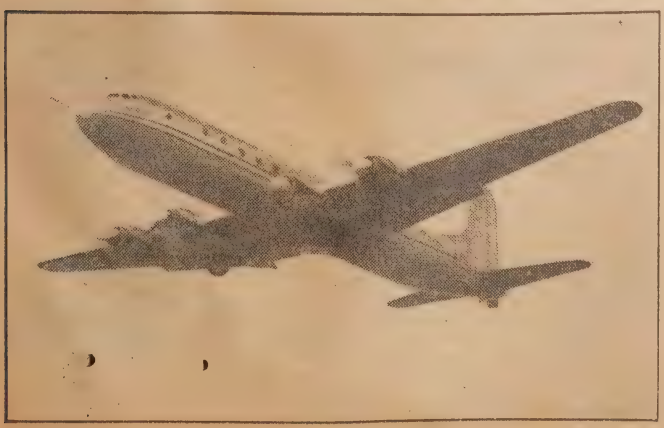
**Price £14.0.0 Plus Tax**

## WHERE TO SEE IT . . .

N.S.W.: John Martin Pty. Ltd., George Brown & Co. Pty. Ltd., Fox & MacGillycuddy Ltd., Bloch & Gerber Ltd., Dominion Factors Pty. Ltd., Electronic Parts Pty. Ltd., VICTORIA: Veall's Electrical & Radio Pty. Ltd., Replacement Parts ty. Ltd., Hartley's Ltd., John Martin Radio & Electrical, J. H. Fugrath & Co., Arthur J. Veall Pty Ltd. QUEENSLAND: Chandlers Pty. Ltd., Irvine Radio & Electrical Co., Trackson Bros. Pty. Ltd., A. E. Harrold. SOUTH AUSTRALIA: Gerard & Goodman Ltd., Radio Wholesalers Ltd., Unbehaun & Johnstone Ltd. WESTERN AUSTRALIA: Atkins (W.A.) Ltd. TASMANIA: W. & G. Genders Ltd., NEW ZEALAND: Allum Electrical Co. Ltd.

Made by **RADIO EQUIPMENT Pty. Ltd.** 5 NORTH YORK ST., SYDNEY
Phones: B 3678, B 1960, M 6391

# BRITAIN BUILDS A FLYING WING



BRITAIN'S contribution to flying-wing aircraft, the Armstrong-Whitworth AW52 is shown during its first public test flight.

This new aircraft climbs at 4800 feet per minute and cruises for 1550 miles at 330 miles per hour at an altitude of 36,000 feet.

The wing, swept at an angle of 25 degrees, has a span of 90 feet.

Capable of seating up to 60 passengers in luxurious comfort, the Avro Tudor VII is here seen retracting its wheels shortly after take-off. It differs from the Tudor II in being powered by Bristol Hercules radial engines instead of Rolls-Royce Merlins. In the rear of the cabin is a lounge and bar.

# BARGAIN RELEASES

## P.M.G.
## Adjustable Morse Keys

We have made another purchase of these brand new, genuine P.M.G. Adjustable Morse Keys and we are now able to sell them at the ridiculously low price of 10/- each.

P.M.G. MORSE KEY **10/- ea**
(Without Headphones).

P.M.G. MORSE KEY. With brand new Stromberg-Carlson headphones .. .. .. .. **19/6**
Postage 1/6 extra

## REFLECTOR GUNSIGHTS

Ex-Air Force. Containing best quality condenser lenses and adjustable reflector. Parts can be used for many purposes. **39/6 ea.**
Postage 2/6 extra.
COMPONENTS INCLUDE THESE VALUABLE LENSES.

1 2 3 4 5 6

No. 1 Diam. 3 5-8 Foc. Len. 10in. No. 2. Diam. 3¾ Hollow Ground. No. 3 Diam. 3¼ Foc. Length 4½in. + No. 4 Diam. 2 3-8 Foc. Length 6½in. + No. 5 Diam. 1 1-8 No. 6 Diam. 1 1-8 Amber Coloured ordinary.

Gent's renovated Pocket watches, nickel and rolled gold—7 and 15-jewels. Fully guaranteed. £2/10/- PRICE & £4/15/-
Postage 1/- extra.

## GREASE GUN

Push-type grease guns, ex-Army. 5oz. Slightly used; perfect order. 12/6 each. 10oz., slightly used; perfect order, 15/- each. 10oz. new, £1 each.
Postage 1/- extra.

Genuine P.M.G.
## Morse Key, with Light

Complete with Steel Carrying Box, 8in. x 8½ x 7. Worth at least £6/10/-. With carrying strap.

**Our Price . . 7/6 ea.**

The Carrying Case, which is complete with shoulder strap, alone is worth the money, or together with spotlight 25/-.
Postage NSW 3/-; Interstate 5/6.

3/11
## METAL TOOL BOX
**3/11 ea.**

3¾ wide, 7in. deep, 15in. long. Ideal for carrying spanners, pliers, hammers, etc. Opens at top and has leather grip handle. Cost the Army 15/- each. Brand new. Out they go for 3/11 each. Post, N.S.W., 2/- extra; Interstate 3/6 extra.

## TELESCOPES

Artillery Gun sights as used by the Army. 3 plus to 9 plus variable power. Ideal for general purposes, rifle clubs, etc. Length, 22in., diam. 2¾in., weight 10½lbs. The definition and clearness of this scope is absolutely amazing.
Original cost to the Army £65 each.
OUR PRICE .. .. .. **£10/10/-**
Freight, N.S.W., 7/6. Interstate, 12/6

## SUPER TOOL OFFER

SET SPANNERS

One 1/8 x 3/16 whit Spanner. Two 3/8 x 5/16 whit. Tappet Spanner. One ½ x 7/16 whit. set Spanner. One 5/8 x ½ whit. set Spanner.

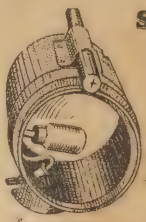
MAGNETO SET SPANNERS

One 2BA x 4BA.
One 6BA x 6BA.
One 11/32 x 3/8.
One 9/16 ring and open end spanner.
ONE SMALL HAND VICE. One 12in. Hacksaw. One Tool Box, 3¾in. x 7in. deep x 15in. long.

**THE LOT FOR £2/5/6**
POST: N.S.W., 5/-. Interstate 7/6.

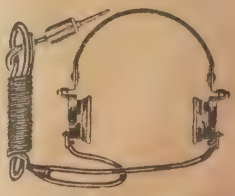
## MOSQUITO NETS
## 14/6

Ex-Army. Green. Brand New. Originally cost the Army 35/-.
OUT THEY GO .. .. .. **14/6**
Postage 2/- extra.



## Spot Light

Ideal for fishing, hunting, shooting. Brand new. Original cost £2/15/- each. Our Price **17/6**
or together with Morse Key, Light and Case, 29/-. Complete with Stand, Freight 3/-.



## HEADPHONES

Brand new, S.T.C. and Stromberg-Carlson. We have just made another purchase of these brand new 'phones, complete with cord and plug, and we are now able to sell them at the ridiculously low figure — 130 ohms impedance .. .. .. .. .. .. **9/6**
Postage 1/6 extra.
2000 ohms impedance .. .. **£1**
Suitable for crystal sets.
PLEASE NOTE: These 'phones are brand new, ex-Army, and not military rejects.

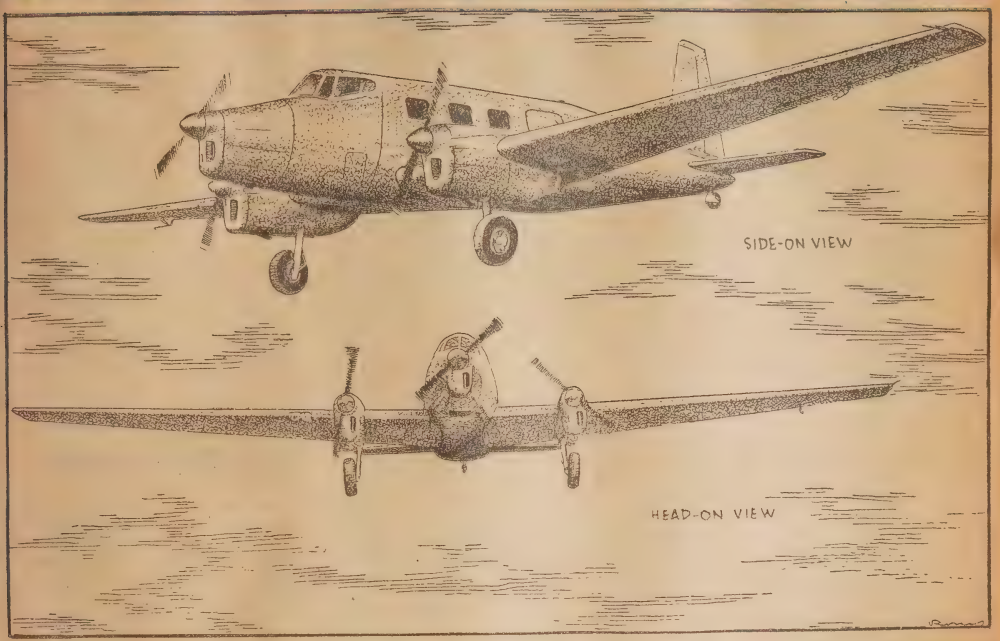
Gent's renovated, latest style, 15-JEWEL WRIST WATCHES—Chrome and Steel Back—Fully Guaranteed.
PRICE .. **£4/15/-**
Postage 1/- extra.

No C.O.D.

# DEITCH BROS.

**210a George Street, Sydney**

# NEW AUSTRALIAN-DESIGN AIRCRAFT




**Test flights were undertaken recently in Sydney of the de Havilland Drover, an Australian-built aircraft which might be described as a three-motor version of the DH Dove. After the successful completion of the test flights, the makers, de Havilland Aircraft of Australia, stated that the outstanding feature of the drover was the ease of control and excellent performance possible with any one of its engines stopped.**

THE Drover is designed to operate on feeder-line services. The company hopes to be able to market the plane in various parts of the world.

As far as possible the structural design has been based on the well-established principles of the twin-engined DH Dove. A third motor (in the nose), was added so as to maintain a satisfactory ratio of climb with one engine inoperative.

The Drover is metal-stressed-skin construction throughout.

Normal passenger seating accomodates six with toilet and ample baggage space, but this can be increased to nine by elimination of the toilet and reduction of the baggage space.

A fixed-type undercarriage is fitted. The brakes are of hydraulic type without power actuation.

It was considered that the tricycle-type undercarriage featured in the Dove would reduce the payload and it was discarded in favor of the conventional main undercarriage and tailwheel. This form of layout also gave increased propeller clearance during taxi-ing, a valuable characteristic for planes operating from rough gravel runways.

The decision to put in hand the design and development of a de Havilland aircraft in Australia was made soon after the war ended.

It has been explained by the company that this decision was in keeping with de Havilland Enterprise's policy of encouraging designs by its oversea companies, particularly where local conditions call for features not available in other DH types.

## AUSTRALIAN DRAGONS

When production of the DH Dragon was stopped in Britain during the war, the Australian company produced 87 Dragons, many of which were made available to civil operators and used in country districts.

It was in seeking a satisfactory replacement for the Dragon that the Australian company set to work to produce the Drover.

The replacement aircraft was required to operate under the same conditions as the Dragon and also to meet many safety requirements introduced by recent legislation. These safety requirements included the need for the aircraft to maintain a satisfactory rate of climb with one engine inoperative. Undue elaboration had to be avoided and maintenance had to be simple, since the plane must be capable of continuous operation without extensive maintenance establishments.

The company has explained that investigations covered a number of layouts.

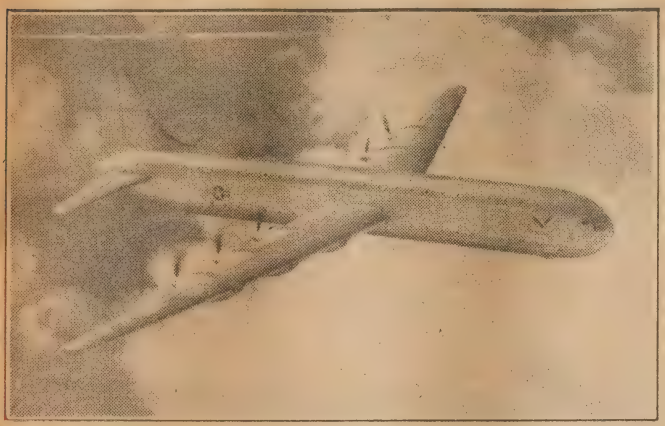
Finally the decision was made to use three 148-horsepower Gipsy Major 10 engines because of the simplicity and ruggedness of this power plant. A satisfactory engine mount and cowling was designed to eliminate the disadvantages of vibration, noise and oil leakage.

The Australian design team completed preliminary work last year. A full mock-up was completed, as well as general arrangement drawings.

Mr. Martin Warner, designer in charge of the project, then visited England for discussions with Sir

**(Continued on Page 77)**

# PICTURE NEWS OF THE WORLD'S SKYWAYS



THE first flight photograph of the Consolidated Vultee's XC-99 military transport and cargo plane, the world's largest land-based plane.

The big plane carried a load of 11,590 gallons of fuel, 1176 gallons of oil and 12,775 gallons of water as ballast.

Headed by Russ Rogers, Convair chief of flight and research, a crew of 13 was aboard.

Wingspan of the XC-99 is 230 feet; length, 182½ feet; and height, 57½ feet. Its gross weight is 265,000 pounds.

The experimental plane can carry 400 fully equipped troops or 100,000 pounds of cargo or 300 litter patients and their attendants.

The new global transport has a top speed of more than 300 miles per hour and a range, with reduced loads, of 8100 miles. Service ceiling is 30,000 feet.

Its six 3000-hp Pratt and Whitney engines, mounted on the trailing edge of the wing, develop as much horsepower as five locomotives.

## Anson Not Dated

A £300,000 order for 12 Anson aircraft, placed with the Avro Company by the Royal Afghan Air Force, draws attention to the continued production of this lively veteran after more than 12 years' continuous service.

Intended for communications, police work and air survey, the aircraft ordered are the MK.XVIII. type, similar in appearance to the civil Avro Nineteen, but suitably equipped for the various functions which will be demanded of it.

The cabin will be furnished for eight passengers; dual controls will be standard on each aircraft.

Full radio and intercommunication will be fitted, and provision will be made for a 40-gallon overload tank, as well as the scheme of amber-colored screens, which, in combination with green goggle-glasses, enables night flying training to be done in daylight.

## Story of Record

FLYING through the dusk with navigation lights on, Squadron Leader Bill Waterton, in a standard Gloster Meteor fighter, has set up a new record for the international 100 kilometre closed circuit.

His speed was 542.9 mph, which is 46 miles an hour faster than the previous best.

Never was a record of this kind set up in more difficult conditions.

Eric Greenwood, once Gloster's test pilot, now sales manager, announced early in the day that, given reasonable weather conditions, the attempt would be made.

Though the weather continued gusty with low cloud, the Meteor took off in the morning and made three laps of a four-sided course at more than 515 mph, an advance of 19 mph over the existing record.

In the hope that conditions would improve during the late afternoon, the pilot and the official observers stood by, ready for another crack at the record, this time a single lap of a faster, five-sided course.

With dusk falling and the lights going on in the aerodrome buildings, the Rolls-Royce Derwent jet engines were started up and the plane took off.

Turning, it flashed across the starting point and disappeared in the failing light.

After a short interval, Waterton's voice came over the radio to the watchers in the control tower: "Everything fine; 491 knots on the clock"—more than 565 miles an hour.

In less than seven minutes, the red and green wing-tip navigation lights appeared, there was the familiar but always impressive torrent of sound as the Meteor passed, and the great effort was completed.

★ ★ ★

*The United States Navy is buying 20 Lockheed P-80 Shooting Star jet fighters for use as transition trainers for its growing list of student jet pilots.*

★ ★ ★

## XB-47 Performance

THE revelation of a 720 mph indicated diving speed for the new swept wing US Air Force Boeing XB-47 bomber proves the new craft not only the fastest bomber, but one of the fastest aircraft ever built, with a top indicator speed in level flight approaching 655 mph, just over the accepted speed record.

The initial 51-minute test flight by Boeing test pilots, Robert Robins and Scott Osleo, took the huge 125,000-pound bomber aloft to 16,500 feet en route to Moses Lake Air Force field in central Washington.

Both pilots pronounced the stability and control qualities beyond their expectations.

Cabin temperature control through heating and refrigerating equipment (for high-speed flights) performed perfectly.

★ ★ ★

## Faster Than Sound

THE Bell XS-1 has flown faster than the speed of sound.

The first flight through the transonic zone was made by Captain Charles Yaeger, of the United States Air Force.

This flight and several subsequent penetrations beyond Mach 1 by Yaeger and National Advisory Committee of Aeronautics test pilots Herbert Hoover and Howard Lilly have been shrouded in heavy official secrecy.

The flights were made at Muroc Field, California.

Flights were timed by radar tracking of altitudes of from 40,000 to 70,000 feet, setting new altitude records.

It is reported that none of the pilots experienced any undue difficulties during their supersonic flights.

Severe stability control and structural load problems generally anticipated failed to materialise.

## Ghost Flies High

DURING a routine test flight, a Vampire fighter, equipped with Ghost gas-turbine engine, reached height of 56,000ft., more than 10 miles above the earth.

Describing the flight, Mr. John Cunningham, De Havilland's chief test pilot, said: "After descending for several minutes I began to feel I should put the wheels down—but found I was still at 30,000 feet."

The height of 56,000ft., which was automatically recorded, was reached in 25 minutes, with a vertical ascent rate of about 75 mph (110ft. per second) for the first 30,000 feet.

The flight was part of the normal course of development testing for the Ghost engine.

It was one of a number of similar flights, and the De Havilland Company points out that Mr. Cunningham had no intention of attacking the world height record—he just happened to find himself at 56,000ft. when he stopped climbing.

To be officially accepted, a new height record must beat the old one by at least 2 per cent., and, while the company has no doubt that the little extra is well within the aeroplane's range, the decision to attack the record must depend upon the degree to which such an attempt might interfere with the urgent development work in hand.

## Stands 4 ft. Waves

THE Grumman Aircraft Company of Long Island, New York, have successfully completed a new amphibian, the Albatross.

The new plane is designated as XJR2F-1.

The NACA designed hull lines enable the craft to operate in 4½-foot waves.

With 4100 pounds cargo load, the Albatross can get off the water in 12 seconds with JATO units.

Designed for US Navy air-sea rescue duties, the amphibian can carry 14 passengers at a cruising speed of 225 mph and a top speed of 270 mph, making it the fastest amphibian ever built.

It can attain a level speed of 212 mph with one propeller feathered.

## How Hot Is Up?

A region of boiling temperatures starting in the thin air 70 miles above the earth and continuing upward for an unknown distance, was described recently by Dr. Ralph J. Havens, of the Naval Research Laboratory at Washington.

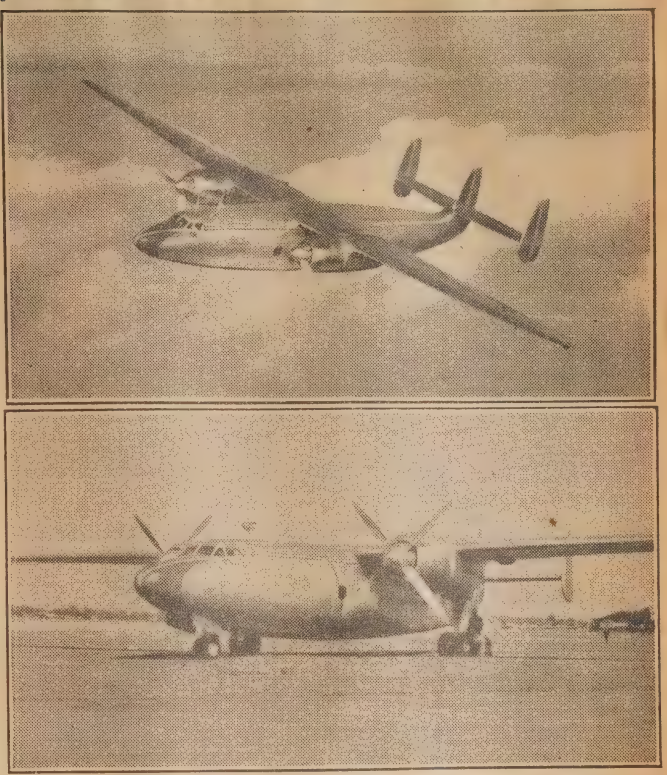
This is the latest finding from analysis of the records of rocket flights above the stratosphere at White Sands, NM.

It had previously been established that temperature declined with altitudes up to about 12 miles, where it reached an average of about 75 degrees below; that it then rapidly increased to a maximum of 110 above at 30 miles, decreased again to about 75 below at 50 miles, and then started to go up once more.

The rocket records now have established that this increase is progressing rapidly by the 70-mile level—where it already has reached 100 degrees above—and there is no indication of any further drop. There is a possibility that temperature may continue to go up as far as the limit of the earth's atmosphere.

The rocket flights also have established that, at great altitudes, there is an enormous increase in the number of charged electric particles responsible for the deflection of radio waves back to earth and in some way associated with emanations from the sun. From the 28 to 50-mile levels, it was found, there are only about 150,000 of these per cubic inch; but in the next 19 miles their density increases to about 3,000,000 per cubic inch.

## CLASSY AIR SPEED AMBASSADOR



Universally agreed to be one of the best-looking aircraft ever built ,the Airspeed Ambassador is also an attractive commercial proposition. When carrying 40 passengers for a range of 1000 miles, it can be operated for less thn one penny per passenger-mile. In its present form it is powered by two 2160 hp Centaurus engines, but the design has been planned so that either two or four propeller-turbine engines may be installed in the future.

## NEW AUSTRALIAN "DROVER" PLANE

Continued from Page 75.

director, and other members of the English company's staff.

After Mr. Warner's return, work of building the prototype was begun. The prototype has now been successfully test flown.

Wing area of the Drover, which is a low-wing monoplane, is 325 sq. ft., and wing loading 20lb. per sq. ft.

The propellers are of the variable-pitch type, operated electrically from the cockpit. Automatic governors are not fitted.

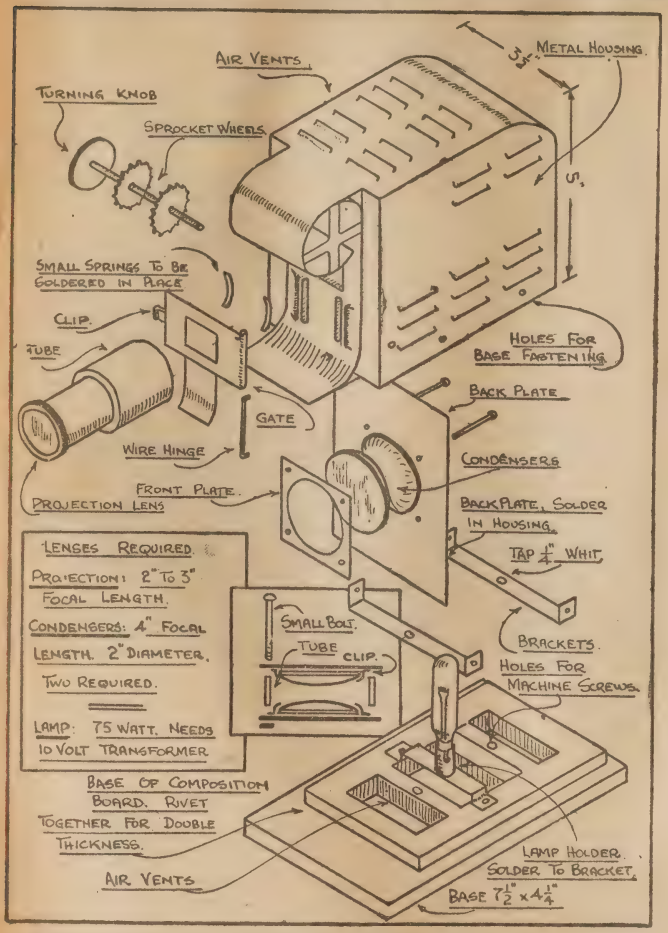
Wheel track covers 14ft. In order to allow operation from unsurfaced airfields, the wheel and tyre sizes have been selected approximately 30 per cent. in excess of requirements.

Cruising speed is 135 miles an hour. Fuel consumption is 22½ gallons an hour, and range in still air, 500 miles. Rate of climb at 6500lb. all-up weight is 800ft. a minute at sea level; and with one engine inoperative, more than 200ft. a minute.

Payload of the Drover is 1400lb.

Dimensions of the plane are: Wingspan 57ft., length 37ft., and height (to top of fin), 9ft. 9in.

# A SIMPLE STRIP-FILM PROJECTOR




**Amateur photographers and others will welcome this inexpensive 35 mm projector. Although it lacks many of the refinements of more exclusive commercial machines, its simplicity and cheapness of construction will appeal to the handyman.**

THE most important thing to watch is the mounting and position of the various lenses and the lamp. The best relative position for each of these can be found by trial and error if temporary supports are made to hold them while experimenting. Carefully note the distance between each unit and use these dimensions as basic measurements for the design of the projector.

Certain sizes are shown in the sketch, but these are only tentative and will depend on the optical equipment to hand. In this case the projection lens was salvaged from an old-fashioned hand-cranked projector. The lens is not the best, but it has a very short focal length, thus giving a fairly large degree of magnification at short projection distances. As well as this two two-inch diameter condenser lenses are needed. These are readily obtainable and fairly cheap to buy.

Make a start on the metal lamphouse, which is made in three sections. Two pieces 6in. x 5¼in. are needed for each side, and one piece 16in. x 3¼in. for the front back and end. On the side pieces mark out a suitable shape such as is shown in the sketch. Cut it out with the tin snips, allowing ¼in. to be folded in for laps when soldering together. Then mark out the position of the air vents. In my case I made them 1in. wide, because I had a sharp chisel of that size. Space them evenly in the positions shown in the sketch.

With a sharp chisel cut out each vent by driving the chisel through the metal into the end grain of a large piece of wood. The metal will cut quite readily with surprisingly little damage to the chisel. The bevel of the chisel should bend the metal outwards like a small awning, but if the shapes are not even bend them where necessary with the pliers. The roof and back each need air vents, too, and after marking and cutting these this piece can be bent to shape. Solder the three pieces together, and after cleaning up any uneven places with a file the job should look quite presentable.

## SLIDE AND HOLDER

The film spool holder and film slide is made from a single piece of tinplate 2¼in. wide. This is quite easy to bend, and the diagram will give you a good idea of the shape. Notice that the film-holding loop has a small slot left through which the film can pass. Carefully clean off any rough burrs that might scratch the film, and this piece is ready to solder to the front end of the lamphouse. A cross-shaped strengthening piece is soldered where shown. Any gaps left at the top and the bottom can be closed with small scraps of tinplate, which are soldered in place.

The gate, being rather intricate, is difficult to describe, yet it is fairly easy to make. Take a piece of sheet metal 4in. x 1¼in. and in the centre of it cut a hole 1in. x ¾in. (a single film frame size). Straighten up the edges and at each end of the metal bend in a lap of ¼in. to make the gate a "U" shape. One arm of the "U" is bent to a small loop to form the hinge. To the other end is soldered a small piece of spring to act as a clip. The hinge is finished off by passing a short length of wire through the loop, bending the ends over and then soldering these to the front of the projector. When soldered in place the centre of the opening in the gate should be about 2¼in. from the top of the lamphouse. Two small lengths of clock spring are fastened in place inside the gate. These help to guide the film and also to keep it flat in place.

## SPROCKET WHEELS

Now through the 1in. x ¾in. opening mark a similar opening in the front of the lamphouse. Cut this out by means of a chisel and a file until the corners are square and the edges are straight. On the outside edges of this second hole guide pieces made from small strips of metal are soldered in place. Put them sufficiently far apart to allow

the film to slide through easily, though not too loosely.

The sprocket wheels I used came off the old projector mentioned previously. If you have none of these, serviceable ones can be made using a little care. The sprocket wheels are fixed inside the housing but the teeth project through the front end. To allow this two small slots, each 1in. x 3-16in. are cut where required. The sprocket wheel axle is a piece of wire passing through the housing. The sprocket wheels are soldered to this and later a small turning knob is soldered on the outside.

## PROJECTION LENS

The projection lens must slide in and out when focusing. For this a metal tube is needed into which the projection lens case will fit. Solder the tube in place on the gate making sure that the 1in. x ¾in. hole comes centrally in the end of the tube. The length of this tube will vary according to the focal length of the lens you are using so do not cut it off till after a trial showing.

The condenser system is made from two lenses of 4in. focal length and two inch diameter fastened in place on a backplate. The method of fastening the lenses in place is by means of a small clip soldered or bolted on to the plates. The details of all this is shown in two places in the diagram. Study this carefully and you will soon get the idea. In both of the plates large diameter holes are cut but they must be a little smaller than the lenses. When mounted the lenses should be fixed curved sides facing each other and about 1-16in. apart. This adjustment can be made by fitting small tubes bent from tin over the bolts that hold the plates in position. The backplate is soldered in the housing, in my case 1¼in. from the front end. If lenses other than the type suggested are used the position of this will alter but can be determined by experiment.

## THE BASE

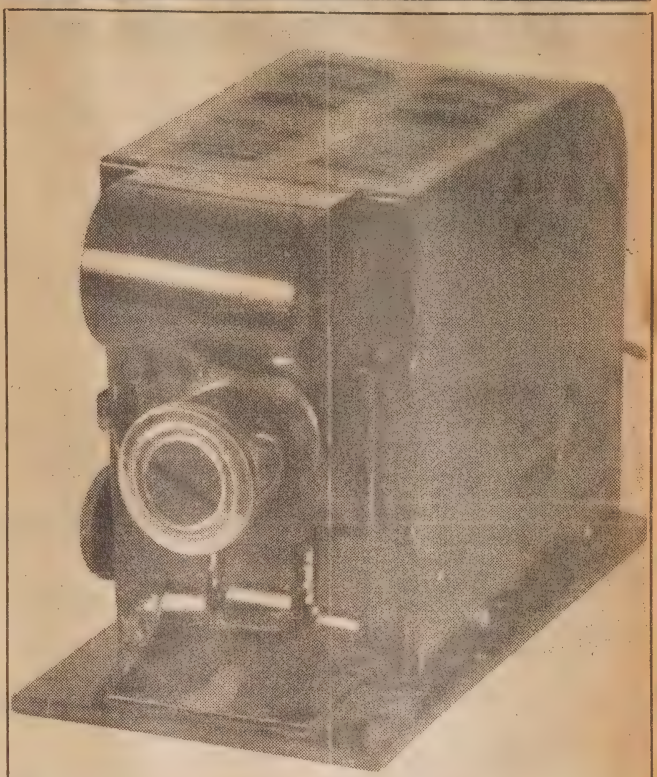
The base is made from composition board 7½in. x 4in. A second piece exactly the size to fit into the lamphouse is riveted to this. For added ventilation it is necessary to cut three large air vents where shown. This can be done with a coping saw after first drilling a small hole through each part. Two small brackets of metal are shown and these are needed to fasten the base in place. These are bent to shape and the holes tapped with a convenient thread so that machine screws may be used in assembling.

Made from a small strip of metal, the lamp holding bracket is bent to shape as shown and has a lamp holder soldered in place where required. The lamp holder needed is of the single contact type and is of the same size as will take a standard car globe. The lamp I use is one of 75 watts running off a 10-volt transformer. A six-volt car headlamp will also suit the purpose, provided a suitable transformer or battery is obtainable. A small hole at the back of the housing allows the light cord to pass through.

The lamp must be fixed in a certain position relative to the condenser system and this is best obtained by trial and error. Assemble the projector but do not fasten the lamp and it can now be fastened the lamp and move it carefully about until a clear image of the filament is thrown on the screen. This indicates the correct place for the lamp and it can now be fastened securely.

Light traps are soldered inside over the air vents but be careful not to impede the flow of air. When all of the soldering is completed and the trial showing of the projector has proved successful, it is time for painting. The inside should be covered with a flat black while a good quality-heat resisting glossy black is suggested for the outside.

## PHOTO OF FINISHED PROJECTOR



The completed job is light, strong, and effective.

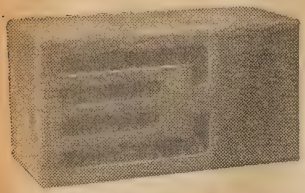
## SYNTHETIC QUARTZ FOR CRYSTALS

QUARTZ crystals, required in optical and electronic devices, and hitherto available only from scattered natural deposits, will be produced by the Naval Research Laboratories, Washington, DC, as soon as equipment is installed for the operation of a new process of growing them.

The method is based on techniques developed in Germany, and depends on the growth of a crystal from a seed placed in a solution of silica, sodium hydroxide or carbonate, and water, heated to 350 to 400 degrees, Centigrade, in a steel bomb.

Pressures generated may reach 2000 to 3000 pounds per square inch. The new method is reported to yield crystals satisfactory for present known uses, and is expected to make the United States independent of the foreign sources from which these essential crystals hitherto have come.

# MAXWELL'S RADIO



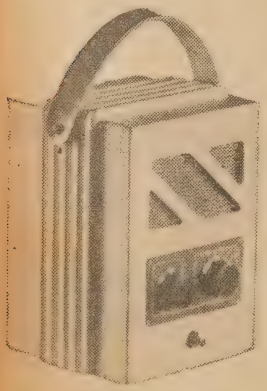
## MINIVOX 3 Valve Kit Set

8¾ x 4¾ x 4¼ inch.

Cabinet -- -- -- -- -- -- -- -- 21/-
Chassis -- -- -- -- -- -- -- -- 4/11
Dial DP47 -- -- -- -- -- -- -- 7/4
Transformer -- -- -- -- -- -- 18/-
Reinartz Coil -- -- -- -- -- -- 5/6
FN Sle. Gang -- -- -- -- -- -- 12/6
3 inch. Speaker -- -- -- -- -- -- 24/-
(Kingsley) and includes transformer.
30 mil Choke -- -- -- -- -- -- 6/8
8 mfd E'lics -- -- -- -- -- -- -- 3/8
10 mfd Cond. -- -- -- -- -- -- 2/3
Condensers -- -- -- -- -- -- -- 9d
Resistors -- -- -- -- -- -- -- -- 6d
Volume Control -- -- -- -- -- -- 3/6
6SJ7 -- -- -- -- -- -- -- -- -- -- 18/4
6V6GT -- -- -- -- -- -- -- -- -- 18/10
6X5GT -- -- -- -- -- -- -- -- 17/10

## Garrard Motors

Stocks of English Garrard Motors are now to hand. Complete with Pick-up and Automatic Stop and Start.
£6/19/6



## COMPONENT BARGAINS

0-1 English "PULLIN" Meters with calibrations 3½in. Dial 1000 ohms per volt: 100 ohms internal resistance -- -- 20/6

VIBRATORS -- -- -- -- 14/6
6 volt 6 pin Synchronous

Dials:
MK17 3in. square -- -- -- 9/6
CD17 3in. square E/Lit. 12/11
DA7 3in. square -- -- -- 9/-
USL44 6in. x 4in. E/Lit. 21/6
Straight Line
B & E 6in. x 2½in. E/Lit. 15/6
Straight Line

## NEW 12 Volt Wet Batteries

10 x 4½ x 10 inch

These batteries are complete with carrying handle and were made for RAAF use -- 27/6

## 12" Speakers 12"

12in. Amplion Complete with transformer. This speaker is especially suitable for quality reproduction work. Ideal for Amplifier, Radiogram or Console.

**£4/3/8**

Also 12in. GOODMAN ENGLISH Hi-Fidelity speakers with TWEETER -- -- -- -- £14/10/-

## Handie Talkie 4 Valve Kit Set

Cabinet -- -- -- -- -- -- 21/-
Chassis -- -- -- -- -- -- 3/11
Loop Aerial -- -- -- -- 6/8
Midget 2-Gang -- -- -- 21/-
(Kingsley)
Midget I.F.'s -- -- -- -- 13/9
Midget Osc. Coil -- -- -- 4/9
3in. Speaker and Transformer -- -- -- -- -- -- 24/-

Valves: 1T4 -- -- -- -- 20/6
„ 1R5 -- -- -- -- 20/6
„ 3S4 -- -- -- -- 20/6
„ 1S5 -- -- -- -- 20/6
Dial and Knobs -- -- -- 7/4
Miniature Switch -- -- -- 2/3
Condensers -- -- -- -- -- 9d
Resistors -- -- -- -- -- -- 6d
8 mfd. E'lytic -- -- -- -- 3/8
1 meg. Potentiometer -- 3/6

# MAXWELL'S RADIO

**48 ELIZABETH STREET, MELBOURNE C.1.** **CENT 4913**

*Add Postage to all Amounts* *Same Day Despatch*

# GLUES, CEMENTS, AND ADHESIVES

Some further notes on a subject of particular interest to all home handymen. Some of these mixtures may make your job easier.

PASTE and glue can hardly be classed as cements, but when added to other compounds of a gummy or resinous nature they decrease the brittleness of the mixture. Concoctions of glue, lime and vinegar may be termed glue cements, while mixtures of flour pastes and glue are cements of another character, useful in cases where the surfaces are not subject to moisture.

Dragon's blood is a resin and is used to impart a reddish or brown color to resinous cements. Canada balsam is another resin, and is largely used for cementing glass objects together where transparency is desirable. Burgundy pitch is a flexible resin mainly used in plasters, and is substituted by admixtures of resin, pitch and turpentine.

Dry clay powder and borax with water is another cement constituent. For glass instruments a cement composed of four parts of Canada balsam and one part of Venice turpentine, heated over a hot-water bath and added to a good quality glue solution, can be recommended.

White (clear) glue and curd soap mixed with plaster of paris is the basis of another useful mixture. Sulphur and plaster of paris can also be made into a paste with a solution of glue. This must, of course, be used right away.

## PORTLAND CEMENT

It is imperative that no free clay should be present in the water, the sand or ballast when making up Portland cement.

Albumen is an animal food and is the chief constituent of the white of an egg. Mixed with lime this compound makes a quick-setting cement, especially suitable for fine work.

There are three sources of albumen; the white of egg already mentioned, animal blood and casein. This last-named material is the curd of milk and is now a commercial commodity.

When casein is made into a thick mucilage or pasty mass with lime it forms a hard-setting cement useful for a variety of purposes.

Egg albumen is commonly employed for uniting broken china and glass objects. It forms a reasonably fireproof and insoluble cement which hardens with age. In extracting the white of the egg it is important that none of the yolk should be mixed with it.

Blood albumen is employed for coarser jobs, and is not usually required in work which comes within the scope of the handyman.

Casein powder can be dissolved in liquid ammonia to form a thick varnish which dries on paper objects with a nearly waterproof gloss. Solutions of other alkaline substances, ie, carbonate of soda and sodium hydrate, also of silicate of soda (waterglass), also take up casein to produce solutions which act as a binding medium for various materials.

## RUBBER COMPOUNDS

Marine glue is an old-fashioned glue compound into which a solution of rubber or gutta-percha is added in the attempt to produce a glue or caulking cement which will resist moisture more successfully than ordinary hide glue. Thickened, with other substances, such as plaster or resin, marine glue would make a useful waterproof cement with a certain amount of contractile (sticking) power.

Rubber which has been vulcanised is useless for preparing cements. The material must be pure Para rubber ("caoutchouc"). This is perfectly soluble in benzine, petrol and other light oils and spirits. Waterproof cements may be made of heated mixtures of dissolved rubber, pitch, resin, shellacs, &c., and care must be exercised in heating them because of their highly inflammable nature.

## RED LEAD CEMENT

For pipe joints, red lead and linseed oil, or common vanish, is largely used. A linseed oil paint is almost as good, and in applying all these jointing preparations the steam or water tightness is much improved if it is put on with a gasket of string or other fibrous material. In the case of a flat or face-to-face joint which is drawn together by screws or bolts, the efficiency of the job is improved by cutting out a paper insertion—a replica of the jointing surface, pierced with the necessary holes—this being smeared on both sides with the cement in a state thin enough to be painted on.

## PLASTER CEMENTS

Mix dry plaster of paris with a weak solution of gum arabic. The paste must be used at once, and is very suitable for fixing silver and plated mounts on to glass vessels. A little alum will help to harden the final compound. Plaster of paris has the property of swelling slightly just before setting hard and therefore it fills the crevices of a hole very well.

Admixtures of alum or borax retard setting rates; common salt accelerates the time of setting. Alum hardens the plaster, as already noted, and this mixture makes the plaster into what is known as Keene's cement. Borax and plaster is called "Parian" cement, which also sets hard with a good, clean surface. A mixture of plaster with hydraulic lime is called Scott's selenitic cement. There are other forms of plaster of paris (gypsum) subjected to heat treatments which are used for building purposes and set less quickly than the common plaster.

## CHUCKING CEMENTS

Difficulty is often experienced in chucking a light or awkwardly shaped article in the lathe. Chucking cements, meltable by heating, are therefore used to grip the objects in the lathe. They may consist of pitch (five parts), plus one of tallow, both admixed with one part of wood ash. A similar cement can be made from resin, with a slight amount of Venice turpentine in it to render it less brittle.

Another hard plastic cement can be made by melting up two parts of resin with one-eighth part of Venice turpentine and a little linseed oil. Glue jelly is also prepared and mixed in. The compound so formed is again mixed with whiting. When cold the compound is hard, but becomes plastic by warming it.

## SERBATS MASTIC

A mastic cement known under this name can be made of a mixture of manganese dioxide (pyrolusite), sulphate of lead in equal parts and linseed oil.

# AERIAL COUPLING UNIT

(Continued from Page 35)

rs, the actual method of connection depending on whether series r parallel tuning is required.

The tuning coils plug in to four in jacks, arranged vertically down he left-hand side of the panel, two ins serving for the tuning coil and wo for the coupling link. This low mpedance link either receives the rive from a similar low impedance ink on the transmitter tank or ouples to the aerial input circuit f the receiver.

The change over relay and coxial output sockets are entirely ptional fitments, which should, however, work in rather nicely with the equirements of the average amateur tation. In its "at rest" position, the elay connects the link through to he receiver aerial terminals, but ransfers the link to the transmitter utput line, when energised.

## ENERGISING

The method of energisation is likely to vary with individual station installations, but one convenient method is to energise it from the plate current of the oscillator, buffer, or final stage. The usual type of relay available now from disposals sources will work on 60-150 milliamps for the 200 ohm bobbin, and upwards of 25 milliamps for the 1700 ohm bobbin. The cord connecting to the bobbin is a length of plastic flex, seen in the photograph. The relay could, of course, be replaced by a knife switch of conventional pattern.

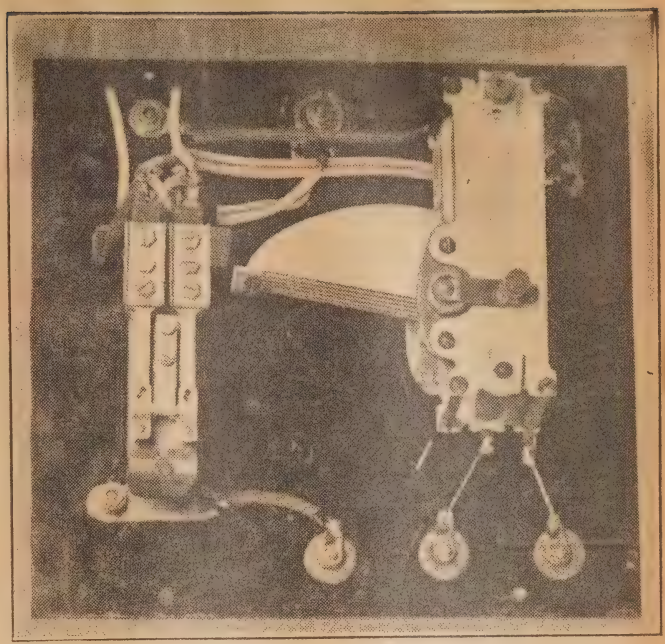
The tuning unit can conveniently be screwed to the wall in a position handy to both receiver and transmitter, with the feeders connecting to the terminals from the top. For 7, 14 and 28Mc. operation, terminals 1 and 2 should be bridged across to give a parallel circuit connection, and the feeders brought in to terminals 1 and 3.

For 3.5mc. operation, the shorting link is removed, and the feeders connected to terminals 1 and 2, thereby giving series tuning.

## COIL DATA

The coil data, as set out, should be correct for most cases, although variations in tuning will occur due to the normal variations in feeder characteristics. Coils for the 14 and 28 megacycle band can be self-supporting, while the 7 megacycle coil, if wound with heavy wire, will need only a couple of transverse strips cemented along it to maintain rigidity. The 3.5 megacycle coil will normally have to be wound on a cardboard former and it is suggested that the two halves of the coil, each comprising 20 turns be separated sufficiently at the centre to allow the link to be wound between them.

The exact nature and length of the low impedance connections to both



Rear view of the unit showing tuning condenser and change-over relay.

transmitter and receiver are not critical, and anything from 50 ohm coaxial cable to parallel lamp cord can be employed. If you are fussy on this point, some variation in the number of turns on the link may be worthy of some experiment.

The final point is in regard to the meter, which is wired in series with the tuned circuit. The fact that it was available and impressive to look at had quite a bearing on its inclusion in the unit. The actual reading will not mean very much in terms of radiated power, but, if due note is taken of the reading on various bands, the meter will show readily if the transmitter is operating normally on successive occasions, while it will also indicate variations in power due to changes in drive, voltage, tuning, &c.

## METER DEFLECTION

Even with a moderately powered transmitter — around the 50 watt mark — a relatively insensitive RF ammeter will give useful deflection, such as one calibrated to 0.8 or 0.10 amps. A more sensitive type meter will need to be heavily shunted to avoid danger of overload.

Operation and adjustment of the unit is not particularly difficult. One method of adjustment is to tune the transmitter tank coil to resonance and then introduce the output coupling link only enough to give slight indication of loading by the aerial. Then adjust aeril tuning condenser for a rise in final plate current, indicating that the aerial is drawing power. Gradually increase the amount of coupling, readjusting the tank condenser each time until the final valve is drawing the desired plate current.

In some cases it may not be convenient to remove the coupling link from the final tank circuit, and a different approach must be adopted. Adjust the transmitter tank circuit for resonance with the aerial connected, then vary the setting of the aerial tuning until the position is found where the final plate current rises to a maximum. Retune the final tank again for minimum plate current and the aerial loading for maximum plate current. A certain amount of interaction is inevitable, due to the mutual coupling between the circuits, but it is possible to arrive at correct settings for both. Adjustment to the coupling link on the final tank will permit the correct loaded plate current to be achieved.

Once the aerial has been resonated for each band, the condenser setting can be recorded and the only adjustment necessary each time is the normal adjustment to the plate tank condenser.

COIL DATA FOR AERIAL UNIT.

| Band Mc/s | TUNING COIL Wire | Turns | Dia. | Length | LINK Turns | Dia. |
|---|---|---|---|---|---|---|
| 28 | 12-14 | 4 | 1¼" | 1¾" | 2 | 1¾" |
| 14 | 12-14 | 7 | 2" | 2¼" | 2 | 2⅛" |
| 7 | 14- | 17 | 2" | 2¾" | 4 | 2½" |
| 3.5 | 16- | 40 | 2" | Close wound | 7 | 2" |

# SHORT WAVE NOTES BY RAY SIMPSON

## RADIO MONTE CARLO HEARD HERE

### BEGIAN CONGO PHONE LINK

**The most interesting new station logged during the past month is, we think, Radio Monte Carlo which is now being heard at very good strength in the late afternoons and is also audible as early as 3,30 am and still coming in nicely at 6.0 am**

JUDGING by the strength of signal we should say that this station is now using its new 25 kw transmitter, which was supposed to be in operation last November. A change of frequency has also been made, as the station now comes in on 6.038 mc, instead of its old channel of 6.13 mc.

At time of writing these notes we have had no reports from other listeners concerning their reception of Monte Carlo, but considering the strength at which the writer hears it we feel sure that it must be audible at many other locations, and will be reported in next month's letters.

The best time to log this new station is around 5.0 pm, when they give news in French, followed by musical numbers from around 5.20 pm. Both male and female announcers have been heard, and station can easily be identified, as both at the beginning and end of the news it announces, "Ici Radio Monte Carlo." This will be a new country for most of us, and we now look forward to receiving our verification before very long.

**BELGIAN CONGO—South Africa Telephone Link.**—A rather unusual transmission was recently heard from the Belgian Congo on 19.23 mc, when opening the new telephone link between that country and the Union of South Africa.

There was a talk by the Governor-General, and then various officials spoke on different aspects of the new service. Later on they exchanged information concerning the different rates between various other of the African colonies and protectorates, &c.

Unfortunately, they did not give any call letters, but just identified themselves as "Belgian Congo calling." We could not locate the Johannesburg station with which they were working, but could hear it back through the monitor at the other station.

**ROYAL VISIT.**—The forthcoming Royal Visit by their Majesties the King and Queen in the early part of 1949 will most assuredly be well covered by Australian radio stations. We can look forward to many special broadcasts, which will no doubt be transmitted from the various outlets of Radio Australia. Overseas listeners will thus be able to follow the progress of the tour by means of their short-wave receivers. It is hoped that by that time the New Zealand short-wave stations will be in permanent service, as they will be of great use while our Royal visitors are in the Dominion.

**VIENNA, AUSTRIA.**—This station has taken rather a long time to verify reception, but when the card did arrive it proved to be well worth waiting for.

On the one side is a colored view of the "Schlob Belvedere," which is a very ornamental wrought iron gate surmounted by a crown, shields, &c. On the reverse side of the card verification details in English are given, ours being for 7.175 mc and 11.785 mc.

The card is signed by Public Administrator of the Austrian Broadcasting System, but unfortunately the actual name cannot be deciphered. The address shown is Argentinierstrabe 30a, Wien IV, Austria.

**DAMASCUS, SYRIA.**—The first verification we have heard of from this Near East station is one recently received by Art Cushen, of New Zealand. They verified his report of their 6 mc transmission by a letter sent by air mail, signed by the General Director, Syrian Posts, Telegraphs and Telephones, Damascus. The director advised that the station was only temporary and at the present time was operating with 500 watts, but also added, "we are establishing three powerful stations on the short waves and we hope to finish them in the near future." Times of operation are given as 3 pm to 5 pm, 10 pm to 11 pm, and 2 am to 6 am.

**KZBU, PHILIPPINES.**—Readers will remember the new Philippine station we listed in last month's issue, KZBU, located in Cebu City. We have just heard from Rex Gillett that he has received a very nice letter of verification from the station, in which they say: "We are very glad to hear from you to be the first one to send reception report outside the Republic of the Philippines."

Congratulations, Rex, on this very fine effort. KZBU is a sister station of KZPI and KZOK and is operated on 6.1 mc by the Philippine Broadcasting Corporation, Gitiaxo Building, Comercio-street, Cebu City. The station advises that from March 24 they will be on the air for 18½ hours daily.

**OTM5, BELGIAN CONGO.**—In June last we sent a report of our reception of OTM5 on 6.295 mc, and we have just received the usual folder from the Belgian National Broadcasting Service in Leopoldville in which they say: "Thank you for your letter of June 16 reporting on reception of our regional station, 'Radio Congo Belge.' This is indeed the first report from Australia of this station."

> SHORT-WAVE Notes for the May issue are due on April 10. For the June issue they are due on May 7. Please send them direct to Mr. Ray Simpson, 80 Wilga-street, Concord West, NSW.

By the same mail we received another verification for their 11.645 mc channel: "In reply to your letter of September 3, we have great pleasure in informing you that you are indeed the first listener in Australia to report on our new frequency of 11.645 mc." This station is only experimental, has no official call letters, and is used in parallel with OTC5

## READERS' VERIFICATIONS

Mr. E. Moore: HI2T, Vienna, HJFA.

Mr. R. Gillett: KZBU, OAX4J, XRRA, VP4RD, Paris 7.24 7.28 mc, XEQQ, CKNC, CKCS, PRE9, OIX7, TGWA, ZJM5-6-7.

Mr. A. Cushen: OTC2, CHOL, CKCS, CHLS, CKLO, CKNC, PRI3, YDA2, YDD3, Rome 9.63 11.81 mc, Sofia 9.33 mc, Damascus 12mc.

Mr. H. F. Buggins: OAX4Q, HJCA, ZPA3, YSR, PZH5, ZRK, VQ7LO.

Mr. H. R. Cox: CBRX, OLR3A, Manila 11.84mc, VUD, PCJ, 9.59 mc, XGOY, Macassar 9.265mc, Singapore 9.69mc, Batavia.

Mr. R. Block: Paris 9.55 11.845 mc, PCJ, 9.59mc, 6025kc, Algerie 11,765mc, 9.61mc, OTM3, OTC2, Rome 9.63mc, Tangier.

Our own listening post:—Rome 7.25 mc (first report from Australia), Vienna 7.175mc, 11.785mc, OTM5 6.295mc (first report from Australia), YFA4, Leopoldville 11.645 mc (first report from Australia), SBO, SDB2.

## LA VOX DEL YUNA

**DOMINICAN REPUBLIC.** — Quite a number of readers have reported reception of the well-known Ciudad Trujillo station, HI2T "La Vox del Yuna," which is now operating on a new frequency of 9.73 mc.

Actually, of course, this is not a new station, but it will be to many listeners who have not heard it on their old channels of 7275 mc or 11.9 mc. We can honestly say that this Latin American is the strongest we ever remember hearing, and quality is excellent at all times. It switches on its carrier around 9.40 pm, and then from about 9.45 pm plays an identification chime of about seven notes, repeated every few seconds, until the station opens up a few minutes before 10 pm.

A four-note chime is then given, followed by station announcement, in which the call letters HI2T and the broadcast band call HI3T can clearly be heard. The station slogan, "La Vox del Yuna," followed by "Ciudad Trujillo, Republica Dominicana," completes the opening announcement. News in Spanish follows, which is excellent for compiling a report, as many names can easily be understood. Quite a number of the musical items are popular American recordings, with the vocal in English, which all helps to make it easier.

This station can also be logged from around 6.30 am, but at that time it is not nearly as loud as it is at night. Go after this one, as it sends out a very attractive verification card.

**CANADA.** — The Canadian station, VE9AI, which is located in Edmonton, Alberta, and which used to be on 9.54 mc, has now changed its frequency to 6.005 mc, and on a recent Sunday night we heard it in a special programme until it closed at 6.40 pm. This programme consisted of innumerable messages being read to people in, we think, Alaska, and were of a family nature in most instances.

Strength of signal was not very good, and the noise level was unusually high, with a nice selection of man-made hash superimposed on it. Sufficient was obtained, however, to tell who it was, as the messages made good material for a report. The station finally left the air after playing "God Save the King."

**ROME, ITALY.**—Rather an interesting letter was received from the English announcer, Miss Rita Perrin, who conducts the English broadcasts from Rome. This letter verified our reception of Rome on 7.25 mc. Miss Perrin said: "We hope to hear from you again and that you will ask your friends to write, too, to let us know how our programmes come through.

"Yours was our first Australia report on our 7.25 mc outlet and we have also received a couple from NZ." This station is now using 6.085 mc and 9.63 mc with their programme in English till 6 am. The address shown on the letter is Presidenza del Consiglio dei Ministri, Servizio radiodiffusioni per L'Estero, Via Vittorio Veneto 56, Roma, Italy. International Reply Coupon is not required.

**HJFA, COLOMBIA.**—Still another very fine verification was recently received by Ern Moore, of Brisbane. His latest is for HJFA, located in Pereira, Colombia, and which he heard on 6.054 mc last August. The verification took the shape of a letter in Spanish signed by the manager, E. Valencio. In their letter they state that they are using 6000 watts in the antenna and are affiliated with the NBC in the USA, and also use the services of the BBC, London.

The station slogan is "La Vox de Pereira" and they transmit the programmes of their broadcast band outlet HJFE. Congratulations to Ern on this very nice verie as the Latin Americans always take a lot of patience to log

# RESULTS OF D.X. CONTEST

## SENIOR TO NZ—JUNIOR TO NSW

**Here at last are the results of our DX Contest which has been in progress since the early part of last year. Even with the extension of time allowed to entrants, verifications which were expected did not arrive in time to be eligible for the competition.**

THE prize donated by the writer of these pages for the winner of the Senior Section has been awarded to Mr. Arthur Cushen, of Invercargill, New Zealand, whose entry comprised verifications from 87 stations in 42 countries, giving him a points score of 3654.

Hearty congratulations go to Mr. Cushen for this very fine effort, which is yet another example of his prowess as a DX listener.

In the Junior Section we are pleased to announce that one of our younger listeners has won the very fine prize kindly donated by the Sydney Radio firm, John Martin Pty., Ltd., the successful DX-er being Mr. Raymond Block, of Petersham, NSW.

Mr. Block's point score was 2730, made up of 78 verifications from stations in 35 different countries. This was indeed a very fine effort by this young listener and shows what can be done by careful listening and forwarding a correct and comprehensive report.

Now a word or two regarding some of the actual verifications submitted by the two winners. It is interesting to note that Mr. Cushen did not receive one verification from the USA, and, in all, wrote to 160 stations in 70 countries.

### BEST QSL'S

Among the best QSL's we noted YNVP in Nicaragua, HJCA Colombia, CE970 and CE1173 Chile, ZPA3 Paraguay, TG2 Guatemala, Monte Corlo, ZJM6 Palestine, and many more too numerous to mention.

Some fine verifications were also included in Mr. Block's entry, among the best being ZQP Northern Rhodesia, Tirana Albania, Beirut Lebanon, XDA Mexico, CE1190 Chile, LRM Argentina, Omdurman Sudan, and Sofia Bulgaria.

Our runner-up in the senior section was Mr. M. Foster, of Mount Vincent, NSW, with 65 verifications from 24 countries, and Mr. M. Krumbeck in the junior section, with 31 verifications from 19 countries.

Generally speaking, we were disappointed in the number of final entries for the contest, as at the time it was first announced many listeners signified their intention of competing. It is therefore a pity that they all did not send in their entry by the closing date. One of the reasons for the above was the feeling held by many listeners that as they had only received a comparatively small number of verifications in relation to the number of reports sent out, they would not stand a chance, and therefore did not submit their total as originally intended.

We feel that any future contest which may be conducted will have to be so arranged that it does not extend over such a long time, but should be something which can be decided very soon after details of the competition are announced. When a contest drags over for many months, interest must wane, and the original enthusiasm is lacking towards the end.

To the winners, we once again offer our congratulations and to all others who submitted their entries we say many thanks, and hope that each and everyone of them will someday be equally as successful as Mr. Cushen and Mr. Block.

## JOHANNESBURG CHANGES FREQUENCY

**SOUTH AFRICA.**—Although the stations of the South African Broadcasting Corp. are never heard at very good strength in the eastern States of Australia, careful listening will eventually enable those who get up early enough to log all of them.

The Johannesburg station has now changed frequency to 4.8 mc, and around 4.0 am reaches sufficient strength to enable it to be copied reasonably well. Another channel which we have tried for years to log is Joburg, on 9523 mc, and, quite by chance, we have at last landed it. The best time to hear this one is between 1 am and 1.30 am, as shortly after this time the BBC turn on GWJ on 9.52 5mc, which, of course, completely blots out anything on 9.523 mc.

As readers will remember from the verification details we published in last month's issue, the Air Force station, ZRB, located in Waterkloof, South Africa, are now operating on 9100 kc.

After many unsuccessful attempts we have at last managed to log ZRB on this new channel when it was heard from around 12.30 am till closing, a few minutes after 1 am. Strength was rather weak, and suffered from severe Morse interference from XTW, but sufficient was logged to enable a report to be sent off. The programme was being relayed from Johannesburg. At 1.0 am the announcement was given, "Johannesburg calling," followed by a few minutes of talking, and station then closed at 1.10 am. Try for this one any time from about midnight, when receiving conditions are favorable.

**AUSTRALIA.**—We have all become used to hearing the Perth station VLW7 operating on 9.52 mc, as it has been there for a long time now. Tuning over this band recently we noticed that it was missing, so, after a short look around, we located them at greatly improved strength, using VLW5 on 9.61 mc.

This is a very big improvement to VLW7, as it is free from interference, which was not the case before, as Radio SEAC was using the same frequency as Perth. It was actually the fact that VLW7 was not now in use which enabled the writer to log Johannesburg on 9.523 mc, as mentioned in a previous paragraph.

## NEW STATION LOGGINGS

| Call | Kc. | Metres | Location | Time Heard |
|---|---|---|---|---|
| HCJB | 5990 | 50.08 | Quito, Ecuador. | 6.0 pm |
| VE9AI | 6005 | 49.95 | Edmonton, Alta, Canada. | 6.0 pm |
| Monte Carlo | 6038 | 49.68 | Monte Carlo, Monaco. | 5.0 pm |
| Munich | 7250 | 41.38 | Munich, Germany. | 6.0 am |
| ZRB | 9100 | 32.97 | Waterkloof, South Africa. | 1.0 am |
| ZRH | 9253 | 31.50 | Johannesburg, South Africa. | 1.0 am |
| VLW5 | 9610 | 31.22 | Perth, Western Australia. | 10.0 pm |
| HI2T | 9735 | 30.82 | Ciudad Trujillo, Dom. Rep. | 10.0 pm |
| KWIX | 11860 | 25.30 | Los Angeles, Cal., USA. | 8.0 pm |
| Munich | 15150 | 19.80 | Munich, Germany. | 4.0 am |
| VLG11 | 15210 | 19.72 | Lyndhurst, Victoria. | 1.0 pm |
| SEAC | 17730 | 16.92 | Colombo, Ceylon. | 10.30 am |

# FLASHES FROM EVERYWHERE

**CANADA.**—Rex Gillett informs us that the Canadian Broadcasting Corporation will now use the following schedule from February 29:

European Service: CKNC 12.15 am to 9.5 am and CKCX 12.15 am to 2 am (Mondays to 2.30 am), CKCS 2 am to 9.5 am (Mondays from 2.30 am). Caribbean Service: CKCX and CHOL 9.20 am to 10.32 am (Wednesdays to 10.30 am, and Thursdays to 10.59 am). The same two channels are used to Latin America from 10.32 am to 12.5 pm (Thursdays from 10.39 am to 12.35 pm). The service to Australia and New Zealand on Sundays remains unaltered.

**ARGENTINA.**—This country has been in the news of late, and we are indebted to the Universalite for the following information about the State-owned station, LRA. An attempt is being made to increase the power of LRA1 to 20 kw (it is now using only 5 kw). This will only be a temporary measure, as they expect to receive a 100 kw transmitter to enable them to undertake international broadcasting. Programmes are being reorganised and in the near future, news bulletins, lecture, &c., in English and French will be given.

This is designed to present the social, cultural, and economic life of Argentina on an international scope and to promote closer ties between nations of the Western Hemisphere, particularly between N and S America.

**ANTARCTICA.**—The claims being made by different countries as to the sovereignty of certain portions of Antarctica give added interest to the following item which we learn of from Radio Australia. The Chilean Antarctic Expedition uses the call letters CARA on 16.595 mc from the "Rancagua" in contacts with Punta Arenas. The latter probably replies on 6.705 mc.

When CARA is on phone it also uses the calls X8 and M8. In addition, it also has channels on 11.029 and 7.351 mc, the former being used mainly for cw. We doubt very much whether any of these outlets will be heard in Australia, but still, under favorable conditions, it is quite possible.

**MOZAMBIQUE.**—In a letter recently received from Mervyn Laubscher in South Africa, he tells us the following concerning the well-known Lourenco Marques stations. They have commenced tests on 9.715 mc on Saturdays from 10 pm till midnight. (CR7BE is listed for this frequency). The above tests are preparatory to an extended session to cover Saturday afternoon local time as at that time the South African Broadcasting Corporation stations are off the air.

The Lourenco Marques people have been pestered with reports to come on the air at that time, and also on Sunday afternoons, as their programmes are much more popular than those from the SABC, who confine their programmes at that time to classical music, &c.

**PAKISTAN.**— At the present time, the only broadcasting stations in this new country are the medium-wave outlets at Peshawar, Lahore, and Dacca, but, according to a recent item in Radio News, the Pakistan Government has decided to purchase additional transmitters to give a coverage equal to that of the Indian stations. The provisional plan involves construction of a 100 kw station, possibly at Karachi.

Two 20 kw and two 10 kw stations are also required and if delivery can be made in six months they will probably be bought in England. A technical expert, Mr. Riaz Ahmed, at present in England, has already been in contact with the chief transmitter manufacturers and also the BBC.

**SWEDEN.**—Radio Australia advises that as from February 28, the Swedish Shortwave Service commenced a series of programmes compiled by the well-known Swedish DX-er, Arne Skoog. These DX programmes are broadcast in English and may be heard each Saturday from 5.45 pm over SBO 6.065 mc, and SBT 15.155 mc. On Sunday at 1 am over SDB2 10.78 mc, and SBT 15.155 mc.

At 11 am on Sundays, there is another programme from SBU 9.535 mc, and also from SDB2. Reports on these programmes would be greatly appreciated and should be sent to "Radiojanst," Stockholm, Sweden. We have checked the reception on SBO on Saturday afternoon, and it can be heard at quite good strength.

appens when the sun stops shining?" we erect the machines in areas here the sun is virtually shining ll day, how do we transport the nergy generated to where it is most eeded? And, what is more im-ortant, how do we arrange for it ) be available just when we want ?

The most awkward problem is in ne storage of generated power. In ll probability, sun machines would e located away from centres of onsumption. Although electricity s the most convenient form by /hich power may be transmitted, it s very difficult to store, other than n "accumulators" or storage bat-eries, which in any case will accept nly direct current, and not the al-nost universal alternating current.

## STORING POWER

There are, however, other possi-ilities. The sun machines could be used to pump water into reservoirs, eventually to operate generating plants. They could be used to com-press and liquify air or other gases, which in this form could be trans-ported with comparative ease. In-genious minds could probably sug-gest many other similar methods. The overall efficiency of such sys-tems will probably be low, but re-membering that the sun presents no bills to be paid, we could use bigger machines to compensate.

Another element found almost everywhere in large quantities is water. Water is composed of a mix-ture of oxygen and hydrogen gases, which in correct combination could be used to drive internal combus-tion engines, the mixture being diluted with air to give the required power release rate. By such com-bustion, water is again formed, which could be used over again if necessary.

## WATER POWER

The major difficulty here is that the only method of separating out the two gases from water is by electrolysis, and this operation re-quires considerable amounts of power. This might be supplied by the sun machines which, we should remember, would require only main-tenance to keep them running. The sun's power is free. Alternatively, research might provide another and more convenient method of reducing water to its oxygen and hydrogen. It is only a short time ago that scientists were pessimistic about their chances of obtaining atomic power through lack of a practicable method. Is it too much to suggest that this separation could not be effected in other ways, some of which might emerge from research in the realms of atomic fission?

Another source of power which has already been used to some ex-tent is wind power. Many thousands of small units are in operation at the present time, consisting of elec-tric generators which charge stor-age batteries in country areas. The batteries themselves drive radio sets and home lighting plants.

Not all areas have sufficiently con-stant wind velocities for these units to be effective. But there are places where the wind blows for con-siderable periods with little variation in velocity. All we require is a wind velocity sufficient to maintain generator speeds which will allow the generators to function. In other words, too much wind is less of a problem than too little. There are plenty of examples to show how effective wind power can be in practice.

Having obtained our power by this method, the storage and distribution problems would be essentially the same as in the case of the sun machines, allowing for differences in geography.

Australia might well be an ideally situated country for research in all these matters. It is a land of abun-dant sunshine, it has many natural waterways, and has no oil deposits of any magnitude. Nearly all its power comes from coal, and the mines will not last for ever. On the other hand, we have an ever-developing industrial potential which must be powered. Could there be a greater challenge to our brains than this great question-mark of power for the future? Could there be a greater reward than cheap, abundant power from a source which can never be exhausted?

# WORLD'S CONSUMPTION OF OIL

**To illustrate the increase which has taken place in the world's oil consumption we quote the following by Robert Russell, President of the Standard Oil Development Co. of USA. He has, naturally, confidence in his own industry to supply oil to the world, but in the remainder of his statements we have not quoted, he stresses the importance of examining other potential sources of liquid fuels, and the necessity of improving engine efficiency to conserve oil.**

AS the future is viewed through the eyes of the petroleum research scientist, certain trends are seen which will undoubtedly influence our activities for at least the next decade. Foremost among these trends is the growth in world demand for liquid fuels. The percentage of total world energy supplied by petroleum has jumped from 16 per cent. in 1925 to about 30 per cent. today.

A few figures illustrate this trend. In 1914 only 4 per cent. of the world's merchant fleet tonnage ran on oil. In 1945 over 75 per cent. was oil-burning. The horsepower from petroleum installed in the United States increased from 5½ mil-lion in 1935 to 45 million at the end of 1945. The war provided a strik-ing example of our dependence on oil for energy. A typical military division in 1918 had 4000 horse-power behind it, but in 1945 the horsepower of a mechanised division exceeded 187,000.

Or the world picture may be scan-ned from the point of view of oil consumption prospects. The per capita consumption of oil in the United States is 9.35 barrels per year. World consumption per capita is 0.33 barrel. The difference is tre-mendous. If the rest of the world were to attain the same consumption rate as the United States, the petro-leum industry would have to pro-duce almost 19 billion gallons of oil per year to meet demand.

Or take gasoline: Per capital con-sumption in the United States is 3.97 barrels, whereas the world per capita figure is only 0.12 barrel. To bring world consumption to the same relative position as the United States would require over eight billion bar-rels of gasoline per year, or roughly 15 times this country's present pro-duction.

Of course, the rest of the world will not attain the level of consump-tion in the United States for many years—if ever. But, as industrialisa-tion proceeds throughout the world, consumption will increase in propor-tion.

### ATOMIC ENERGY A HELP

These figures have extreme signi-ficance to those of us engaged in petroleum research. They mean that our efforts will be directed towards achieving economy through efficiency in use, and towards development of synthetic substitutes. We also as-sume that other energy sources will come along from time to time to take some of the load off the oil industry.

Atomic energy is a promising source, but it seems most unlikely that atomic energy will be used for powering automobiles or aircraft. However, there is no reason why it should not eventually find applica-tion in large stationary power and heating units, and possibly even in large ships.

Our liquid fuel research has made us consider not only new engines and new materials, but even new con-cepts of combustion itself. The com-bustion problem is almost entirely mechanic. In other words, if satis-factory mechanical means for mixing the air and fuel at or before the point of combustion are provided, then there seems to be no limiting restric-tion on how much fuel can be burn-ed in a given space or on how well it will burn.

Therefore, the mechanical con-struction of burners plays an im-portant part, and burners, whether for an ordinary household lamp or heating furnace, or for a modern jet propulsion engine, must be ade-quately designed. Nevertheless, the basic phenomenon of combustion is fundamental, and knowledge of the mechanism of combustion is essen-tial.

# THE HAM BANDS WITH BILL MOORE

**The RSGB's Beru Contest for this year will be run on similar lines to previous contests. The Beru Contest is very popular as it affords an opportunity to contact the rarer British Dominion stations.**

THE following is a synopsis of the rules covering Australian and New Zealand stations:—

There are three sections—senior and junior transmitting sections and the receiving section.

The contest is open to members of the RSGB, and to members of the WIA and NZART. Members of the last two named national societies should certify on their completed logs the fact they are financial members of the society concerned.

Contacts with or reports from ship or unlicensed stations (in countries where licences are obtainable) will not count for points score.

Only one operator will be permitted for any one station.

A trophy will be awarded to the financial member of the RSGB scoring the highest number of points in each section.

Certificates of merit will be awarded to the first three stations in each section and, providing sufficient entries are forthcoming, to the first and second in each prefix zone.

Entries must reach the RSGB not later than 14th June, 1948. Logs should state date, time in GMT of contact, band, station worked, serial number sent, and received, and points claimed for contact. Details of the station should also be supplied, plus a statement, signed, that you have observed the rules.

The contest commences 0001 GMT Saturday, 3rd April, to 2359 GMT Sunday, 4th April, and again from 0001 GMT 17th April, to 2359 GMT 18th April.

Fifteen points will be scored for the first contact in a prefix zone outside the competitor's own zone on any specific band, 14 for the second, 13 for the third, and so on. The 15th contact scores one point, and one point is gained for an additional contact.

This scoring procedure is repeated on each band. (This is a change from previous contest, encouraging multi-band operation.)

Only one contact can be made with any specific station on any one band during the contest.

The contest is for two-way CW working, and power is limited to 150 watts in the senior section, and 25 watts in the junior section.

A serial number of six figures must be exchanged, the first three the RST report, the second the number of the contact—001 for the first, 002 for the second, &c.

Entrants receiving consistent tone reports of less than T8 will be disqualified.

Prefix zones are as follow:—No. 1—D2, E1, G, GC, GD, GI, GM, GW. No. 2—J4 and VS6. No. 3—MB9, SVO, X. No. 4—MD1, 2, ZB1, 2. No. 5—MD3, 5, ST, VQ6 (MD4). No. 6—MD6, VS9, VU7, VS8. No. 7—VE1. No. 8—VE2. No. 9—VE3, 4. No. 10—VE5, 6. No. 11—VE7, 8. No. 12—VK2, 3, 7. No. 13—VK1, 9. No. 14—VK5, 6, ZC2. No. 15—VO1, 2, 3, 4, 5, 6. No. 16—VP1, 5, 7, 9. No. 17—VP2, 3, 4, 6. No. 18—VP8. No. 19—VQ1, 3, 4, 5, ZD 6. No. 20—VQ2, ZE. No. 21—VQ8, 9. No. 22—VR1, 2, 3, 4, 5, 6, ZK1 2, ZM. No. 23—VS1, 2, 4, 5. No. 24—VS7. No. 25—VU2. No. 26—VU5, XZ2. No. 27—ZC4 (MD7), ZC6. No. 28—ZD1, 2, 3, 4, 8, 9. No. 29—ZL1, 2, 3, 4. No. 30—ZS1, 2, 3. No. 31—ZS4, 5, 6.

An analysis sheet should be prepared, showing prefix zones and point and contacts on each band, and forwarded with log.

## UHF Award

THE ARRL announce a UHF award for 1948. Open to all amateurs, a bronze medallion will be awarded to the station working the most States on 50-54, 144-148, and 235 mcs and up.

Quite a number of English stations have good records already with respect to States worked. Since December 31, G stations have been permitted to work on 50mc, with certain limitations. G5BY has contacted 24 USA States already.

DX on 6MX is now practically an everyday occurrence somewhere on the globe. W5VY has worked four continents, North and South America, Europe and Oceania, only two more for the 50mc WAC.

W6UXN and W9DWU, with 46 States on 50mc, are really close to WAS—things are surely happening on 6.

Quite a lot of comment has been centred on the crowding of the low frequency end of the 50mc band. Checks between G5BY and WIHDQ have shown that a QSY from 50mc to 52mc was sufficient to drop the signals right out. Tests made when the band was barely open, show that a QSY of only 300 kcs was enough to drop the signal right out. It is no wonder the gang are sticking to the low end.

### THE UHF's

VERY little sporadic E seemed to be about during February, and early March, and main activity was centred on some long runs, assisted by temperature inversion.

On 6 VK2GU, from Canberra, has contacted VK2BZ in Newcastle, a distance of approximately 220 miles, and has also worked 2ADT in Cessnock, a slightly shorter distance. Besides Sydney station contacts, VK2GU has also worked 2RU in Gosford and 2LY in Katoomba.

Signals between Newcastle and Canberra vary greatly in strength, but the path between Canberra and Sydney remains open most of the time, with signals up to S8 for long periods.

Event of the month was a contact between Newcastle and Sydney on 1296mc. Congratulations to VK2BZ and VK2VW

for another first. and it is easily the ongest distance from home QTH to home QTH. 2BZ's signals were heard by a number of Sydney stations; he was using in 829 in the final operating as a tripler.

Earlier in the month, 2BZ's signals were heard in the Blue Mountains by 2LZ, 2FI, and 2LY at up to S8, and contact between the Blue Mountains and Newcastle should be made shortly.

6MX opened to VK5 on several occasions from NSW, and also from Queensland. The link between 4LN and 4HD, Gympie to Buderim (correct spelling), 100 miles, is still open, and, so far, looks like being a 24-hour channel.

4RY and 4HR are working across Brisbane on 166.

NSW UHF meeting for February was the scene of a lecture, "Radar to the Moon," presented by Mr. C. Higgins, VK2LO, and Mr. A. Shane. The lecture was a graphic and descriptive story of radar through space. UHF enthusiasts from Newcastle and district travelled down to the meeting.

The VK6 "scare" on Wednesday, March 3, caused quite a stir amongst the 6MX gang.

A VK6 came on 20MX telephony, calling franctically for the east coast, and stated that VK3, 4, and 2 stations, were breaking through on 6. Time 2200 to 2245 hrs. E.A.S.T. It looked as if the long-awaited WAS was close by. However, on checking further, the stations logged seemed to be operating on 14mc.

At the time of writing it is not quite clear whether the whole matter was an elaborate hoax, or not. If so, the UHF gang are looking for the perpetrator, and the wouff-hong won't be in it! It of course, may be some peculiar form of doubling spotting.

## The 1947 VKDX Contest

THE results of the WIA's 1947 DX contest, as announced in "Amateur Radio," shows a much greater interest than in the previous year. The number of overseas logs received must have been very gratifying to the contest committee, who really did the hard work with the checking of the logs.

NSW stations were well ahead in most of the CW sections. The open section, as anticipated, was won by Dave Duff, VK2EO, with a total of 750 contacts—all DX—more than a year's work for most of us, and all accomplished in two short weekends. Dave and his Zepp must be written up as one of the most successful combinations in DX history. Second place was filled by Jim Cowan, VK2ZC, who operated on 14mc only. Third was Tubby Vale, VK2ANN, of Bega.

Scores in the 14mc were high, and all three places were won by Hunter Valley stations. First, VK2DG, 107,616 points, second VK2ZC 97,773, third VK2AHA 91,465. 2DG, with 76 countries on 14mc in two weekends, has a good start in any DXCC event.

Queenslander VK4AP headed two Sydney stations to win the 28mc CW section with 23,808 points. Second and third were 2HO and 2JX respectively.

The first three places in the 7MC section went to 3DQ, 2RA, and 3HG, in that order, and 3.5mc to 2RA, 3HG, and 2ANN.

The telephony section was not so well supported, and three Western Australian stations filled the major placings in the open section. VK6RU, 49,350, was the winner, and 6HL 34,152 and 6FL 32,088 the minor placings.

First place in the 28mc section went to the Hunter Valley VK2ADT, with 19,980 points. Jack set out to win this section, and was just ahead from 6RU 18,900 points.

14mc phone section, 3IG 27,195 points, the winner, 3LN, 10,440, 4KS 9984, second, and third. 3.5mc, 2RA was the only placing.

Next year should see the ZL's back with us, to make it even more interesting. The VK's will have to work harder for their DX, although the re-entry of the NZ's should attract more of the choicer DX.



## DX AND PERSONAL

CONDITIONS for the month were extremely poor, and they did not help the DX gang operating in the various DX contests. The ARRL CW contest was poorly supported. 2EO, 2VA, and 2YC seemed most active in NSW (no progress scores by request). ZL's were very active in their special DX test, in conjunction with the Otago Celebrations.

Choicer DX included WG1YQ/KJ6—14,121—1800 hrs., HP1YL—14,070—1700 hrs., GC4LL—VFO—1800 hrs., Y12FDF—14,100—1700 hrs., and ZC1AL—14,005—1700 hrs. The latter two are easier worked in the afternoon than at 2400 hrs., when the signals arrive via the short route.

Queries of the month include LB4QA on 40, and SLQT on 20—QTH, please.

Congratulations to Roy Tandy, VK3KX, first to qualify for the WIA's DXCC, and also to Gordon Cole, VK2DI, a close second.

## DX CONTROL

THE recommended abbreviations for DX control by DX stations are being used more frequently. They originally were listed by the ARRL as QHM, QMH, QLM, and QML, the Q being dropped when an extension of the Q code incorporated the above abbreviations.

The meanings are quite obvious; HM—will start tuning at high end of band and tune to middle. MH will tune from middle to high frequency end. LM low to middle, and ML middle to low.

By use of these abbreviations, DX stations can control the multitude and avoid the forming of "dog-piles" on their frequency.

CR9AN uses LM quite frequently, with the result his frequency is invariably clear. VK stations, under certain circumstances, could successfully use these abbreviations.

# OFF THE RECORD — NEWS & REVIEWS

**A new Beethoven symphony recording is always news, and in this month's lists we have a new version of his shortest work of this kind. The "Eighth" has a definite place among the immortal nine for all that.**

By JOHN MOYLE

VIENNA PHILHARMONIC ORCHESTRA, conducted by Herbert Von Karajan—SYMPHONY No. 8 in F MAJOR, Op. 93." (Beethoven). COLUMBIA LOX. 646/8.

This has always been a favorite symphony of mine, and for the life of me, I can't imagine why it is not played more often in our concerts.

Musically, it represents Beethoven at his best. It is an expression of his worth as a symphonist, but without any of the inner conflict which makes other symphonies greater but not more beautiful to hear. One feels able to relax completely with this symphony, and to enjoy the worth of the melody, development, and interplay of instruments which, incidentally are very well handled both by orchestra and recording.

The conductor is new to me, and for that reason, I spent an enjoyoble hour comparing the performance with the earlier recording of Weingartner. I have always regarded it as quite a bright light among records of its day.

Broadly speaking, both conductors have seen the work in much the same way. Weingartner takes it appreciably faster except, rather surprisingly, in the last movement, where the new set shows extremely brilliant drive.

The recording, too, is very similar in nearly all respects. It is rather a tribute to the earlier records, although I do not know when the new set was actually made. The fact that the orchestra is the same makes the comparison all the more interesting.

On the whole, the new records I would class as being a little cleaner, with exceptionally well-balanced and full bass, although Weingartner's set were certainly not lacking in this respect.

I liked these records immensely, and you could not do better than to add them to your collection. I would choose it as the set of the month because it is worth most for itself, and for the audience it is bound to attract.

There are very few doubtful passages as far as reproduction is concerned, even on the high-grade amplifier and pick-up I have been using. The average equipment should play it cleanly with the possible exception of about a half-inch at the end of one side. And that's not bad going.

ALEXANDER NEVSKY - CANTATA (Prokofieff) by the Philadelphia Orchestra conducted by Ormany, with Jennie Tourel (mezzo-soprano) and the Westminster Choir in English and Latin. Columbia LOX 841-5.

This is described as a "thrilling performance of a moving and powerful contemporary choral work, expanded from the score of a famous Russian film." No description could be much better than that.

It is frankly programmatic, depicting a number of scenes apparently from the film itself. The style is the traditional harsh and uncomprising "Russian" type, which makes one wonder if the Russians ever find much to laugh about. The recording throughout is admirable, with a fine bass in particular. The choral is striking not only in performance, but for the entirely competent economy of composition. The soloist has a fine voice, exceptionally well suited to the music. You moderns will find plenty in this release.

E. POWER BIGGS, Organist—1. Fugue In C (Fanfare Fugue). 2. Sheep May Safely Graze (Bach). HMV ED.571.

The fugue—written for trumpet stops—is a most exciting and completely successful piece of work. You will get quite a thrill from it, particularly if your amplifier is good on the high side. The second part is well done, but gives a disturbing impression of being played on a small organ—almost hurdy-gurdy one might say—although that is possibly a bit on the hard side as criticism. As might be expected, it is splendidly handled by an experienced and well-known organist. Well worth hearing.

ANDRE KOSTELANETZ AND HIS ORCH.—"Ave Maria" (Schubert) and "Ave Maria," (Bach-Guonod). COLUMBIA DOX.907.

I was really surprised with this record. One tends to shy away somewhat from yet another version of the Ave Maria's, but Andre has done an excellent job. There is no sentimentalising or Stowkowski-ising about it — in fact I caught a note of sincerity in approach which was most refreshing. I can see this record being extremely popular.

FRANK SINATRA conducting the Columbia String Orchestra — "Air for Oboe" and "Air for Bassoon." (Wilder). COLUMBIA DOX.908.

Another surprise, and don't let Frankie's name fool you. This is extremely pleasant music to hear. The "Air for Oboe" gave me a shock in its recording. A few inches from the start there is a little jingle effect. I first played this record in our laboratory on our new amplifier, and I give you my word, I walked into the outer office under the impression that someone was actually rattling a bunch of keys or something like that. It wasn't until I found no one there that I realised it was actually on the record. A tribute both to the reproducing system and to the recording. I wonder how many of you will hear it as well as that?

Mitchell Miller is the oboist, which is a guarantee of a good performance. There's nothing in it to excite the intellect, but it is very pleasant listening.

OSCAR NATZKE, Bass, with Orchestra from Royal Opera House, Covent Garden, conducted by Karl Rankl—"Magic Flute" (Mozart), O Isis and Osiris; Within These Temple Walls. COLUMBIA DOX.911.

A fine, well recorded disc. It is in fact so typical, that there isn't much more to be said about it for those who know the singer. The accompaniment is equally good.

JOAN CROSS, Soprano with Philharmonic Orchestra, conducted by Collingwood—"Cosi Fan Tutte" (Mozart)—Rondo, Act 2 (2 parts) 1—Ah! My Love, Forgive My Madness. 2—Ah! Mine Own, So True, So Tender. COLUMBIA DOX.912.

Somehow I don't altogether get convinced about Joan Cross, who nevertheless is exceedingly well recorded here. She has her moments, but her voice seems somewhat uneven, which is a very hard thing to cover when recordings are so good. I often think that many good singers are libelled in recording for this reason, in that the recording studio is designed to catch everything with much greater sensitivity than that of the ear itself, which accounts for the fact that in real life their work is much more acceptable. It's a good record all the same.

ISOBEL BAILLIE, Soprano Piano acc. by Gerald Moore—"To Music" (Schubert) and "Ah Yes, Just So" (Bach). COLUMBIA DO.3102.

A slight record, both in performance and recording. Isobel Baillie is wise in that she rarely attempts work which demands a robustness which isn't a feature of her singing. She shines where purity and delicacy are required, and for that reason, these two are perfectly acceptable as far as they go.

PHILADELPHIA ORCHESTRA, conducted by Leopold Stowkowski—"Es Ist Vollbracht" (All Is Fulfilled)i (Bach, arr. Stowkowski). HMV ED.567.

One more of the Stowkowski arrangements for which he is famous. It features the strings as might be expected, with some fine woodwind, and you will like it. Personally I would have liked just a little more strength in the bass, which I think could have been achieved without spoiling the smooth, broad treatment. It might not always be Bach as he was written, but it's very beautiful to hear. One section on the second side might be a bit hard to play cleanly.

## OTHER RELEASES THIS MONTH

**H.M.V.**

VAUGHN MONROE AND HIS ORCHESTRA—"You Can't Hide Your Heart Behind A Kiss" and "My, How the Time Goes By." EA.3648.

FREDDY MARTIN AND HIS ORCHESTRA—"Santa Catalina" and "Beside You." EA.3649.

HELEN CARROLL AND THE SATISFIERS AND ORCHESTRA—"Do You Love Me Just As Much As Ever?" and "Smoke Dreams." EA.3650.

WILLIAM PRIMROSE, Violist with Piano Accompaniment — 1. Jamaican Rhumba; 2. Matty Rag, and 1. Cookie; 2. From San Domingo. ED.569.

THE HALLE ORCHESTRA Conducted by John Barbirolli—"Euryanthe"—Overture. EB.407.

WEBSTER BOOTH, Tenor with Liver-

pool Philharmonic Orchestra—conducted by Sir Malcolm Sargent—"Jephtha" (Handel)—Recit. and Air. Deeper and Deeper Still; Waft Her Angels. EB.408.

CHARLES SHADWELL AND HIS ORCHESTRA—"Melody on the Move" and "The Dancer at the Fair." EA.3621.

VICTOR MALE CHORUS (with Tenor Solos)—"Mother Machree" and "When Irish Eyes Are Smiling." EA.3622.

GLASGOW ORPHEUS CHOIR — Conducted by Sir Hugh Roberton—"I Live Not Where I Love" and "The Hermaiden's Song." EA.3623.

PIERRE FOURNIER, 'Cellist Piano acc. by Gerald Moore—"Chorales"—O Man, Bemoan Thy Grievous Sins; The Old Year Has Passed Away; When We Are in Deepest Need." ED.570.

PHIL HARRIS AND HIS ORCHESTRA "Fun and Fancy Free" and "Say It With a Clap." EA.3645.

TONY MARTIN WITH ORCHESTRA——"Lazy Country Side" and "Too Good To Be True." EA.3646.

THE SKYROCKETS ORCHESTRA—"Across the Alley from the Alamo" and "Bow Bells." EA.3647.

JOE LOSS AND HIS ORCHESTRA—"Tell Me Marianne" and "Sleep, My Baby Sleep." EA.3651.

LARRY GREEN AND HIS ORCHESTRA—"Near You" and "Dreams are a Dime a Dozen." EA.3652.

JOHNNY DESMOND WITH THE PAGE CAVANAUGH TRIO — "Guilty" and "Julie." EA.3653.

CHARLIE SPIVAK AND HIS ORCHESTRA—"Fine Thing" and "Spring Magic." EA.3642.

PERRY COMO WITH ORCHESTRA—"What Am I Gonna Do About You" and "I Gotta Gal I Love (In North and South Dakota)." EA.3644.

FREDDY MARTIN AND HIS ORCHESTRA — "Say So" and "Heaven Knows When." EA.3654.

MAURICE WINNICK AND HIS ORCHESTRA—"By the Waters of Minnetonka" and "Trees." EA.3655.

PERRY COMO WITH ORCHESTRA—"Song of Songs" and "Easter Parade." EA.3656.

DUKE ELLINGTON AND HIS ORCH.—"Johnny Come Lately" and "In a Mellotone." Duke Ellington (Pno.); B. Bigard, J. Hodges, O. Hardwicke, B. Webster, H. Carney (Saxes); C. Williams, W. Jones, R. Stewart (Tpts.); L. Brown, J. Nanton, J. Tizol (Tmbs.); F. Guy (Gtr.); J. Blanton (Bass); S. Greer (Drums). EA.3657.

**COLUMBIA**

VICTOR SILVESTER AND HIS BALLROOM ORCH.—"Sleep, My Baby, Sleep" and "Promises." DO.3121.

FRANK SINATRA WITH ORCHESTRA—"Over the Rainbow" and "All the Things You Are." DO.3122.

HARRY DAVIDSON AND HIS ORCH.—Old Time Dance Series—No. 22—"The Saunter" (Underneath the Stars), and No. 23—"The Florentine" (Valse Florentine). DOX.909.

NELSON EDDY, Baritone with Chorus, Organ and Orchestra—"The Lord's Prayer" and "The Lost Chord." DOX.910.

CONSTANT TONE FREQUENCY RECORD—50 cycles to 10,000 cycles, and CONSTANT TONE FREQUENCY RECORD—50 cycles to 10,000 cycles. LOX.650.

CLAUDE THORNHILL AND HIS ORCH.—"You're Not So Easy To Forget" and "Just Plain Love." DO.3110.

DINAH SHORE WITH ORCH. — "You Do" and "(I Don't Care) That's All I Want To Know." DO.3116.

HARRY JAMES AND HIS ORCH.—'Friar Rock" and "The Beaumont Ride." DO.3117.

TONY PASTOR AND HIS ORCHESTRA—"My O'Darlin', My O'Lovely, My O'Brien" and "Tira-Lira-Li." DO.3123.

KID ORY AND HIS CREOLE JAZZ BAND—"Bucket Got a Hole In It" and "Bill Bailey Won't You Please Come Home." DO.3124.

HARRY JAMES AND HIS ORCH.—"My Future Just Passed" and "Too Marvellous For Words." DO. 3118.

LOUIS ARMSTRONG AND HIS ORCH. —Columbia Hot Jazz Classics No. 11—"Tight Like This" and "Heah Me Talkin' To Ya?" Louis Armstrong (Tpt.); Fred Robinson (Tmb.); Jimmy Strong (Clt. and Ten.), Don Redman (Alt.); Earl Hines (Pno.); Mancy Cara (Bjo.); Zutie Singleton (Dms.). Recorded 12th December, 1928. DO.3119.

VICTOR SILVESTER'S STRINGS FOR DANCING — "Emperor's Waltz" and "Voices of Spring." DO.3120.

VICTOR SILVESTER'S STRINGS FOR DANCING — "Pampas Flowers" and "Desiree." DO.3125.

# ANSWERS TO CORRESPONDENTS

**R.H.D. (Kooyong, Vic.)** suggests an article on the procedure to adopt when aligning receivers without the use of suitable equipment.

A. Suitable procedure on the alignment of receivers has been outlined from time to time in "R. & H." magazine and to corelate this information, a reprint of the procedure has been made and is available through the 1/- query service. We thank you, R.H.D., for your words of appreciation of the magazine.

**H.J.H.C. (Northam, WA)** sends in a subscription and offers some suggestions for future articles. He would also like to see some sets for the d-c mains described.

A. Many thanks for your letter and the sub. We will keep your remarks in mind when planning future issues.

**L.W.W. (Kadina, SA),** requests a copy of the Short-Wave Handbook and makes a suggestion for future issues.

A. Your copy has been forwarded to you. Many thanks for the suggestion, but it would entail a lot of extra work in compilation of the list.

**T.J.R. (Hartwell, Vic.),** finds that a 0.05 mfd condenser connected from B plus to earth is necessary to stabilise his set. He would also like advice on how to clear up a whistle which is noticeable at full volume.

A. It is possible that the two effects are due to the same cause. Electrolytic condensers often have a high reactance at radio frequencies and it is necessary to bypass the high tension supply with a paper condenser. The old style wet type is the worst offender. Most circuits include this extra condenser whether or not it is found necessary when the set is new because ageing effects are likely to make it more essential. In some cases it is necessary to experiment to find the best location for the condenser, but often anywhere in the R.F. section of the set will suffice. Other possible causes of the "R.F. whistle" you mention are misalignment or the R.F. and/or the I.F. stages breaking into oscillation. We can only suggest you realign the set and if the trouble persists take the usual steps to isolate the grid and plate circuits of the R.F. and I.F. amplifier stages.

**R.E.L. (Singapore)** renews his subscription and asks where he can obtain some information on building an electric guitar.

A. Many thanks for the further subscription which has been attended to. Constructional details of an electric guitar were given in the August and October, 1941, issues of "Radio and Hobbies." Back copies of these are not available, and unless you can borrow these from a friend, we can only suggest that you write to one of the booksellers in Sydney who may just happen to have a book.

**W.T.F. (Tenterfield, NSW)** inquires about a cabinet for the 1K5-Four.

A. As far as we know there are no cabinets available expressly for the 1K5-Four. However, we suggest you write to one of our advertisers, giving the dimensions of your chassis and other general information relative to the matter, and they may be able to assist you.

**R.S. (Oakleigh, Vic.)** is interested in making a car radio.

A. We do not particularly recommend the use of filament type valves in a car set because of the vibration and the fact that the battery voltage rises well above the nominal 6 v. when the battery is on charge. Cathode type valves are better able to withstand these conditions. A car radio was fully described in the December, 1945, issue of "Radio and Hobbies," and the circuit is available through our shilling service. Since there are a number of problems associated with the construction of a satisfactory car radio, we suggest you try to borrow the issue and read the constructional article. There was also an article in the January, 1946, issue, dealing with the installation of the set.

**R.J.M. (Bordertown, SA)** advises us of a change of address and makes several suggestions for future articles.

A. Your new address has been noted. Most of those who buy ex-military equipment, such as the FS6, use the parts in other equipment. In its original state the FS6 is far from what is required by the authorities on the "Ham" bands, both with regard to the frequency stability and the quality of the phone. An article covering the use of a dynamic microphone was published in a recent issue of "Radio and Hobbies." Many thanks for your kind remarks with regard to our magazine.

**D.T. (Penguin, Tas.)** wants to obtain plans for a 3-valve TRF receiver and also instructions as to how to make a pair of skis.

A. We have a number of circuits such as you require available through our shilling query service. Angus and Robertsons, of 89 Castlereagh-street, Sydney, would be pleased to let you have a list of books covering the latter subject, and we suggest you write to them.

**E.J.C., jun. (Paddington, NSW)** offers a suggestion in connection with Morse code practice for budding "hams."

A. Thanks, E.J.C., for your letter. The whole point resolves down to making the necessary arrangements with a co-operative operating licensed amateur.

**A.McK. (Bexley, NSW)** suggests we mark the pin numbers alongside the various valve connections in our circuit diagrams.

A. Your suggestion has been noted and we agree that such a scheme would be of assistance to many readers. Actually we have already shown the socket connections, in full, for a number of types, such as the new miniature valves and cathode ray tubes. We are very glad to hear of your success with the new set.

**A.L. (Semaphore, SA)** renews his subscription and gives us details of the sets he has recently built from "Radio and Hobbies" diagrams.

A. Your letter was greatly appreciated and it is very encouraging to learn that our designs are so successful, when built by our readers. We certainly hope you are successful in obtaining your ham ticket later on and are able to join in the fun on the air. As you say, it is probably a good idea to spend most of your time studying while you are at school and treat radio as a relaxation for the time being.

**R.H.C. (Townsville, Qld.)** found that reversing the primary winding of the midget English IF transformers resulted in an increase of gain. He suggests that this may be of interest to some of our readers.

A. Your letter noted, R.H.C. Increased gain can result from connecting the IF transformers in that manner, but, depending upon electrode voltages of the IF valves and indiscretion in the wiring layout, instability can occur. The 4-valve version of the circuit in question uses a single stage of IF with higher gain midget transformers connected in the correct order.

**W.F. (Geelong, Vic.)** renews his subscription and asks how he would go about fitting pickup terminals to the "Fireside Five."

A. Your remittance for subscription renewal has been dealt with in the usual fashion. To fit pickup terminals to the "Fireside Five," disconnect the .5 megohm load potentiometer from the IF transformer winding, and connect it to the centre pole contact of a double pole double throw switch. The bottom end of the secondary winding of the IFT2 is connected to one pole of the switch, and "hot" pickup terminal is connected to the other, via a .05 mfd. coupling condenser. The other set of contacts of the switch are arranged to break the screen supply to one of the preceding valves, preferably the 6U7G. Such an arrangement prevents "radio programme" from being heard when the switch is thrown to the "pickup" position. The pickup is connected to the "hot" terminal and earth.

**W.J.R. (Glenelg, SA)** renews his subscription and says that the use of 2 volts on the filament of the 1J6G in the Little Jim 2, instead of the 1.5 volts shown in the circuit, improves the results.

A. Thanks for your subscription, W.J.R. The indication in the circuit of the use of 1.5 volts for the filament was mainly for the convenience of using just one torch cell and, in many cases, this lower voltage did not materially affect the general results.

**A.J.B. (Yea, Vic.)** sends in his subscription and states his appreciation of Radio & Hobbies and the "Short-Wave Handbook."

A. Many thanks for your subscription and we are glad to note that you have got yourself a nice dual-wave receiver. All the best for future short-wave listen-

THE following reprints are available on application at our office, 60-70 Elizabeth-street, Sydney. They will be sent, post free, on receipt of stamps or postal notes.

| | |
|---|---|
| How to build a Synchronous Clock. 4 Pages | 1/- |
| A Pendulum Type Electric Clock. 8 Pages | 1/- |
| Build Your Own Windcharger. 8 Pages | 1/- |
| Coil Details for Small Receivers. 1 Page | 6d. |
| Radio Circuit Symbols. 1 Page | 6d. |
| Collecting Verification Cards. 1 Page | 6d. |

## HOW TO SUBMIT YOUR QUERY

1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.

2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."

3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."

4. Blueprints of exact size chassis layouts with all essential holes and cut-outs will be supplied if available for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, "Radio & Hobbies," Box 2728C, GPO, Sydney.

and congrats on the 136 stations ged on your old two-valve job.

**R.C.C. (Barcaldine, Qld.)** encloses a mittance for the "Short-Wave Hand-ok" and tells us of the success which has had with a simple one-valver. It erates from 9 volts HT and he has ged most Australian broadcast stations d also a New Zealand station.

A. Fine business, R.C.C. Those are good sults for a one-valve receiver. Your der for the Short-Wave Handbook has en taken care of.

**N.H. (Hartwell, Vic.)** sends in a sub-ription to "Radio & Hobbies" and asks hether we have any details for a two-lve mains-operated receiver.

A. The only two-valve mains-operated esign published in "Radio & Hobbies," as "Monty," which used a 6J8-G in a tector/amplifier circuit. It is a more mplicated arrangement than the simple iode but would give better results. hanks for the subscription.

**W.T. (Fitzroy, Vic.)** accompanies his mittance for subscription renewal with ason's greetings. He also suggests that e circuit of a signal tracer be published.

A. We thank you for your best wishes, T., and advise that your subscrip-on has been duly dealt with. A signal acer is on the list of units to be de-ribed in the forthcoming issues. We ight add that the circuit of such a nit, complete with three probes and n electron indicator appeared in the ily and August, 1943, issues of R & H.

**J.W. (Croydon Park, NSW)** thanks us or information supplied through the nilling query service and mentions that e has built four successful R & H sets or friends.

A. Many thanks for your letter which was very much appreciated. We hope our magazine will continue to interest you for many years to come.

**R.N.M. (Camberwell, Vic.)** encloses an advertisement and mentions that he has been a subscriber to Radio & Hobbies since its inception. He has been particularly interested in the reproduction of sound from 35 mm. film and amplifier construction.

A. Many thinks for your letter and good wishes. Your advertisement has been passed on to the department concerned.

**K.R.V. (Lismore, NSW)** sends in an advertisement and at the same time mentions that he has built several "Radio & Hobbies" sets all with great success (and the same parts).

A. Your advertisement has been passed on to the appropriate department. Glad to note your success with the sets although there is a limit to the number of times parts can be used before the pigtails of resistors &c, begin to show signs of wear.

**M.J.McC. (Aspendale, Vic.)** renews his subscription and asks if the VCR139A tube would be suitable for the circuit featured in the January, 1948 issue.

A. Your remittance for subscription renewal has been dealt with in the normal fashion, M.J.McC.. The VCR139A CRO is quite suitable for use in the circuit in question. Attention needs to be given to the different socket connections to this CRO tube. Infinite impedance detectors have been discussed at various occasions in the magazine, but reference to them, will, no doubt, be made at some future date in the section for beginners. We are pleased to hear of your success with the "1946 Standard" and thank you for your congratulations on the standard of the magazine.

# ANSWERS TO CORRESPONDENTS

**R.W. (Hurstville, NSW)** sends in a subscription to "Radio & Hobbies." He is interested in P.A. work and would like to see some articles on the subject published.

A. Your subscription has been attended to and you will receive your copies of "R & H" in due course. We agree that there is a certain call for public address amplifiers. However, there is a number of other projects in our minds at the moment which are of greater general interest and we cannot promise when we will look into the matter.

**P.J.C. (East Malvern, Vic.)** sends in for a copy of the Shortwave Handbook and asks about some valves he has on hand.

A. There is no reason why the valves you have on hand could not be used in a new set if they are in good order. The EF5 has a 6.3 volt heater and characteristics similar to type 6U7-G. It would replace this valve in most applications without change to the circuit. The AF7 has characteristics approaching those of the 6J7-G. As a resistance coupled audio amplifier it would have a plate load resistance of 0.2 megohm, a screen dropping resistor of 0.5 megs and a cathode bias resistor of 2500 ohms. The heater requires 4.0 volts at 0.65 amp. Any of the supply houses in Melbourne could probably arrange to have a transformer with special filament voltages wound. A more economical proposition in your case would be to use a standard transformer with a 6.3 volt heater winding and instal one of the small auto transformers now available to provide the various filament voltages. The "Jeep" circuit from the October, 1942, issue would probably suit your purpose best since it was so designed that a wide variety of parts could be put to good use. Many thanks for your appreciative remarks in regard to "Radio & Hobbies."

## SUBSCRIPTION RATES

The new subscription rates for "Radio & Hobbies" are as follows:—

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| 1 Year | 12 0 | 13 0 | 14 6 | 15 6 |
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**F.A.R. (Beba, NSW)** enquires about vibrator receivers.

A. We see no reason why a radio set should have any effect on the battery and generator provided the set is not run for long periods without the car being used, thus exhausting the battery. We are not familar with the particular set you mention but would suggest that the current drain would be in the vicinity of 2 amps. A car radio using filament type valves should not be used with the engine running, since the generator in charging the battery often causes the voltage to rise well above the nominal 6 volts. This makes the scheme a poor proposition for a car radio as it is normally considered.

**W.J.W. (Dutton Park, Qld.)** has just completed the "Minivox" mantel set and is very pleased with the results. All the Brisbane stations come in at more than comfortable volume with only 12 feet of aerial and he finds that the selectivity is also good.

A. Many thanks for your letter and we are very pleased to hear that the little job came up to your expectations. We were very much impressed with the results we obtained during the test period in our laboratory and would not be surprised if it is considered as a standard small set for some time to come. With regard to the supply of the special components, it takes the manufacturers a little time to get into full swing, but the transformer should be available before you read this. We suggest you get in touch with one of our Sydney advertisers, who will be able to give you accurate information about the matter.

**H.S. (Maryborough, Qld.)** writes to us for information supplied through the shilling query service and wishes us a merry Christmas. He also mentions that hum level in his set has come up of late and he thinks it may be due to the rectifier valve.

A. Many thanks for your letter and we are glad to hear that your set is performing in a more normal manner. We would suggest that a likely cause of the hum is failing electrolytic condensers. The dry units in current use only last a matter of a couple of years or so and need replacement after that period. The crash which accompanies the switching on and off of lights is possibly due to the power transformer not having an electrostatic shield. Alternatively, if the shield is present you may not have earthed it. We suggest you investigate this point and also take care to have your antenna well away from electric power lines.

**R.H.D. (Kooyong, Vic.)** says that his results with the four-valve version of the "Handie-Talkie" prove to him that it is a winner.

A. We are very pleased, R.H.D., that you have duplicated the results we had with the "Handie-Talkie" four-valve. We know that many others of our readers are equally delighted with the performance of this four-valve miniature personal set. We thank you for your good wishes for Xmas and New Year.

**E.K.B. (Armidale, NSW)** suggests that we publish articles on signal to noise ratio with particular reference to grounded grid RF amplifiers and triode mixers.

A. Many thanks for your letter and the suggestion, E.K.B. The whole subject has received quite a lot of attention lately and we hope to publish useful information on it in the near future. We cannot make the same promise, however, in regard to your second suggestion.

# OW TO MAKE THE 'CRYSTAL KING'

(Continued from Page 33)

lered, although you could man- by twisting the bared end tightly nd the connecting point. After ie months, it is possible that this nection may not hold good, al- ugh it should be OK for quite a ile if well and truly made.

The bottom end of the coil is to connected to the moving plates, ich is almost always the same ng as saying to the condenser me. You could slip the bared d of the wire under one of the ndenser mounting feet where it is ewed down to the base-board. is should make a good connection. e fixed plates, or frame, of the ndenser are also connected to the rth terminal, where another rewed down" connection is OK. is earth terminal is also connected one of the headphone terminals. e bypass condenser is connected the headphone terminals by screw- g down the wire leads, one under ch terminal. You can cut these ds shorter than they are to make neat job either before or after ounting in place, or you can leave em just as they are. Scrape the ire "pig-tails" or leads so that they ake a clean join, as sometimes these e a bit dirty electrically.

## OIL CLIPS

The headphone terminal not con- ected to the earth, is connected one side of the crystal holder -it doesn't in the least matter hich side. The other side of the older is connected to a length of ire to which the coil clip is attach- d. You could use here a piece of ire of the same type as used to wind ne coil, although a piece of "hook- p" wire would possibly be a bit ore flexible.

The only other connection is a econd flexible lead running from the erial terminal to the second clip. hese clips are quite easy to obtain, nd generally have screw terminals o them.

The aerial is something with which ou can do a bit of experimenting. As I have already explained, a rystal set cannot amplify, so that he loudest signals will be obtained y stringing up an aerial outside the ouse between two chimneys, or rom the eave of the roof across to ome other elevated point.

## AERIAL

A length of about 50ft. overall— hat is from the furthest aerial point down to the set—should be enough. You could use some of the same wire as for the coil, or better still, a length of covered aerial wire sold for the purpose. This type of wire needs no insulators, and can be brought into the house through a window, which can quite safely be closed upon it.

Bare wire may sometimes be used, if you take great care to see that it doesn't touch any metal object, and is preferably mounted with insu- lators.

In some localities, a shorter aerial, such as a length of wire round a picture rail, might be used. It will have less signal pick-up, however, which can often be compensated for by tapping it further up the coil. I have made all these suggestions so that you can experiment with them, and find out which works best for you.

The earth is often important with a crystal set. The most convenient type of earth is made to a handy water pipe—if there is one handy— by means of a metal clip. Scrape the pipe clean to make sure of a good joint. Incidentally, it is almost im- possible to make a good soldered joint to a water pipe, as it would need a blow-lamp to heat the pipe and the water inside. So I don't advise you to try it.

## EARTH

If there is no pipe available, you could drive a length of metal rod into the ground for a few feet, and use that for an earth. If you use pipe instead of rod, you can pour water down it occasionally, as damp earth makes the best "earth."

The earth wire should be as short as you can make it, although a lead of 10ft. or 15ft. should be OK.

Having fixed all these connections and things, you are ready to try out the set.

Clip the aerial on the first tap from the earthed end of the coil, and the crystal on the first tap from the top end. With your headphones con- nected and on your head, rest the whisker point lightly on the crystal, and tune the dial backwards and forwards. After a couple of tries, you should hear a signal or possibly more than one. "Search" the crystal with the whisker until you strike a spot which gives the loudest signals. You will find a big variation in different spots, and the idea is to find the one which works best. As a rule, light pressure is best, although easiest to jar out of adjustment.

## ADJUSTMENT

If you find you are able to separate stations easily, try tapping the aerial further up the coil. Signals will be louder, and you will reach a tap where the stations begin to overlap. You can experiment with various tap- ping for both aerial and crystal, and have much fun noting the differences made in each case. As a rule, how- ever, you should not require to tap the crystal more than two taps down from the top of the coil, and some- times you might do best with the crystal connected right at the top. The aerial will probably work best not more than three taps from the bottom.

The most expensive part of the set, although it isn't really a "set" part, is the pair of headphones. How- ever you won't get very far without it, so there is nothing for it but to get the best pair you can.

For loudest signals, the phones should have a resistance of about 2000 ohms. These are generally known as high resistance phones. Even old-fashioned headphones may still be in good order and may give good results, as frequently these old phones were of high quality. How- ever it is a good plan to try them out before you buy them, if you suspect they are more than about five years old.

There are many headphones sell- ing quite cheaply today from dis- posals stores. Nearly all these phones are of the low impedance type, of only a few hundred ohms. They were meant to be used with a special step-down transformer, the second- ary of which would be connected to the headphone terminals of the set. The other two transformer leads con- nect to the phones themselves.

## PHONE IMPEDANCE

Quite often, these low impedance phones work quite well from a crystal set, but the volume is almost always better when high impedance phones are used. So, if you are not close to some stations from which loud signals can be expected, you would do well to spend a few more shillings and buy a pair of high im- pedance type.

Occasionally a crystal set is loud enough to make a noise in an old- type horn loudspeaker—that is, if you keep very quiet and don't expect too much. But as a rule, loudspeakers just aren't satisfactory with crystal sets.

# WANTED TO BUY, SELL OR EXCHANGE

FOR Sale or Exchange: Quantity of Radio S/H goods, including No. 11 transceiver complete, valves, speakers resistors, condensers, etc. Send for full list of particulars to **D. Wilkinson, P.O. Box 46, Crookwell.**

FOR SALE: 2JU 5v. Amateur Receiver, featured in R. & H., March, 1947. New, complete, £17. **Grant, 2 Gentle-street, Lane Cove. JB2869.**

FOR SALE: Little Jim 2, complete, less phones, de-luxe cabinet, excellent performer, £6; 1-3 gang cond., 17/-; 1-2 gang for s/w, 6/-; 2-1 gangs for 12/- both; 1 midg. cond., 5/-; 1 dial 550/1600kc., 8/-; 3 Vernier dials for 12/-; 4v cans, 1/- ea.; 1 Reinartz coil, 7/-; 6v. chassis, 6/-. **K. Collins, "Greenmount," Cardelo, N.S.W.**

FOR SALE: R. & H. Minivox, less speaker and cabinet, in perfect working order, £8/10/-. Using Kingsley midget 2-gang condenser with SM gears. **W. Faulds, 8 Milton-street, Canterbury, Victoria.**

FOR SALE: Tom Thumb, complete valves, batteries, phones 4000 ohms. Also 19 valve £5/10/- lot. **R. Cotton, 15 The Drive, Concord Wt.**

FOR SALE: 166mc. 11-valve Receiver modified for 240v. 50 c/s, and speaker operation. New, £10. P58 350-600mc. 18-valve Receiver, 240v. 50 c/s, £55, new. **170 Dunning-avenue, Rosebery.**

FOR SALE: Jet motor for model aeroplanes, etc., single stage comp., 3lb. thrust, set of blueprints, 10/6. **E. Taylor, 16 Onslow-street, Rose Bay.**

FOR SALE: 80 different copies, R. & H., 30/-. **30 Hank-st., Ashfield. UA4983.**

FOR SALE: 80 copies R & H ex. cond. 1939-40-41 complete, 1942 Dec. missing, 1943 Feb. to June missing, 44 June missing, 45 Oct. missing, 46 complete to Aug. Best offer, write **D. Gibson, 33 Brooks St., Bowen Hills, Brisbane, Qld.**

FOR SALE: Tom Thumb 2-valve radio. Complete with batteries, phones and cabinet. Excellent performance, £7/5/-. **R. A. Scott, Church St., Moruya.**

FOR SALE: All new condition, Model 223 AV Calstan Multitester, seldom used, £23; 13.5 watt P.P. Amplifier, K12 spkr., 150 MA power supply and magic eye tuner on two separate chassis, £15. **W. Marriott, Gladstone, Macleay River, N.S.W.**

FOR SALE: Portable Transceiver, 5 watt type A, mk3 3.2 to 9 m/cs, 100 to 250v. AC, 6 volt Vibrator, as new, plus spares and booklet, £12. **R. Pinnick, 333 Nott St., Port Melbourne, Vic.**

FOR SALE: Portable Radio, Lekmek, perfect condition, new batteries, £12. Write **A. Bishop, 22 Segenhoe St., Arncliffe.**

FOR SALE: Kit R. & H. 1Q5—one partly built, complete with case, phone, batts. etc. **R. Bayles, Commercial Bank, Cronulla, N.S.W.**

FOR SALE: Two imported Dynamic microphones, complete with input transformers, £6/10/- each. **G. L. Bell and Co., 34 Martin Place, BW7708.**

SALE: Simple Simon 2-valve (1Q5 and 1G4) Rola 5", 2 batteries in beautiful french-polished cabinet. Perfect order, £8. **B. Mullen, 73 Laman-st., Cook's Hill, Newcastle.**

SALE: US Army BC 728 "Walkie" Receiver, new, with 7 button base, 1.4v. valves, 2v and 6v vibrator pack, new 2v cell 3in. Permag Speaker Telescopic aerial, shoulder strap, lead in. Snap, £18/10/-. **VK2CV, 29 Wangalla Rd., Lane Cove. JB2929.**

SALE: 7 V-ls. I.C.S. text books, Diesel Engineering, £4. **K. Carlyon, 61 Denny St., Broadmeadow, Newcastle, N.S.W.**

SALE: Meccano Parts, used. Write **Taylor, 45 Yamba Rd., Como, N.S.W.** for Catalogue.

SALE: Personal portable receiver, 5v Excellent performance and appearance, stand any test, £18. **Alan Mason, 99 Great North Rd., Fivedock, rear of shop.**

SALE: Six valve Vibrator or Battery Console, Gulbransen. Good order, £8, or offer. **75 Renwick St., Redfern.**

SALE: Pocket Multimeter, AC-DC volts, 10-1000, ohms 1-10,000. New, £5/10/-. **R. Sands, Glenrock, Albert St., Leura.**

SELL: C.V.T. Calstan Model 223A. Valves, etc. Best offer. **Williams, 488 Malabar-road, Maroubra.**

SELL: Palec VCT/V valve and circuit Tester, £25. Portable Radameta Oscillator, £19. Palec Portable DB Meter, £11. Very little use. Perfect condition. **H. McCormick, Dandaloo-street, Narromine.**

SELL: "University" MVA Multimeter, AC/DC, in leatherette carrying case, as new, £9, or offer. **N. Richards, 3 Simpson-avenue, Wollongong.**

SALE: Paton VCT-V, hardly used, guaranteed new condition, £19/10/-. **P. Bessell, Deloraine, Tasmania.**

SELL: 2-valve Portable, complete with 6in. speaker. **7 Moore-st., Ormond, Vic.**

SELL: No. 19 Transceiver, 16 valves, 2-8mc., 240mc., power supply, variometer, cables, £13. **R. Barton, 17 Wilmott-avenue, Carnegie, Victoria.**

SELL: New Ferrotune 5 valve mantel in polished wood cabinet, 8in. Rola Alnico speaker, perfect, £15 or offer. Phillips motor-operated P.B. tuning assembly, new and complete, best offer. Electric gramo motor. Ex metal 6SJ7's (new) for 1852's or 956's. **T. G. Jones, Barton House, Canberra.**

SELL: Crystal Set, complete with catswhisker, £2. 2 0005 gang condensers, 5/- each. 2 Morse Code outfits, 10/- and 5/-. 1 Soldering Pencil, 7/6 or near offer. **S. G. Pauli, "Lynville," Nobby, Qld.**

SELL: 10 watt Hi-Fidelity Amplifier. Wide Range of tone and complete with 8in. speaker, £16 and freight paid. **K. R. Virtue, 4 Ewing St., Lismore, N.S.W.**

SELL: Complete Radio and Television Correspondence Course, as new, for £12/12/-. Cost £18. Also 12 "Popular Mechanics" from April, 1946, for £1. **K. McPherson, 79 Sempill St., W. Maitland.**

SELL: "Avo" Valve Tester with Universal Panel, £25; "Avo" AC Test Bridge, £15; "Avo" All-wave Battery Oscillator, £16; "Avo" Universal Minor Test Meter, £8. All new and unused. Radio Servicing books, etc. **Stacey, "Greenwood," Ennever St., Rainworth, W.4, Brisbane.**

SELL: Vib. Trannies, one 2v-140v/15 ma, excellent order 15/-; one "Astor" car radio, type 6v-200v/50 ma, new, 14/-. Write first, no replies after sale. **A. F. Tucker, Traynor's Lagoon, via St. Arnaud, Victoria.**

SELL: In good order, Valves, 6C5, 6L7, 6K7, 6J5, 6J7, 6Q7, 15/- ea.; acoustic pick-up, 10/-; magnetic pick-up, 30/-. **M. McLauchlan, Coffs Harbor, PO, N.S.W.**

SELL: Little Jim 2, less phones and batteries, new 19 valve, £2. Wanted: Single Shot .22 Rifle, bolt action, good condition. Write **V. E. Sakrewski, Murgon, Queensland.**

SELL: Uncalibrated 4 inch Meter, £1. 44in. x 24in. x 15in. Rack, suit amateur, 25/-; Pr. 6C8G's, Pr. 2F50's, Pr. 6AC7's, 10/- ea. Pr. 30's, 7/6 ea. Other gear, [illegible] **Clark, 57 Jeffrey St., Canterbury.**

SELL: Quantity Radio Parts, Valves, Transformers. Write list. **V. J. Toombs, 58 Mitchell St., Townsville.**

SELL: Tex 2-valve Portable, new batts., no phones, £5. **W. Morrison, 29 First St., Ashbury, Sydney.**

SELL: New 6J5G, 6X5G, 6H6, 6AC7, 807, 6H6GT, 6J7, 6V6. **474 Punt Rd., Win. 2036. £7/10/-.**

SELL: Camera, Folding Ensign, F4 lens, 8-speed shutter, 1 sec.-1-150, takes 8 2¼ x 3¼—12 2¼ square, had four films in it complete with cable, K2 filter and leather case, £25/16/-. **W. J. Lomasney, 26 Park St., Campsie, N.S.W.**

SELL: New Valves, 58, 2A6, 12/6 ea.; 6B6, 6B7, 13/6 ea.; 6D6, 25Z5, 15/- new, U.S.L. 46 dial, 21/-; Pow. Trans. 385, 125 ma, 2.5v., 6.3v., 24/-. Add frt. **H. Felmingham, Glenorchy, Tas.**

SELL: Instruction Manual for Transmitter-receiver ATR2B (technical data, circuits, etc.), 10/-, or exchange for manual on other defence equipment. **A. MacIver, Dutton St., Hawthorn, Brisbane.**

WANTED: "Radio & Hobbies," June and July, 1939, May, 1940. **C. E. Walker, 97a Davey Street, Hobart.**

WANTED: Instruction Manuals, RC transceiver and AT5, AR8 combination. **A. MacIver, Dutton St., Hawthorn, Q**

WANTED: Urgently. One Audio High Impedance Choke. Price and parts to **N. T. Walsh, PO Box 5, Mt. Perry, Q**

WANTED to Buy: A.R.7 Receiver, in or out of order. Condition reasonable. **A. E. Blomeley, 844 Howitt-st., Ballarat, Vic.**

EXCH.: Set of Applied Electricity (new) for A.C. Mantel Radio. **E. J. Stanke, Bertha St., Mt. Gambier, S.A.**

SELL: Palec multimeter, £9. A Mark III transceiver, plus parts for modulator best offer, also vibrator transformer 6/135v., 10/-. **VK2NF, WM2997.**




Printed and Published by Associated Newspapers Ltd. (successors to Sun Newspapers Ltd.) at the registered office of the Company, 60-70 Elizabeth-street, Sydney.